JUNE 1, 1959

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Product Engineering

McGRAW-H[illegible] RESEARCH AND DEVELOPMENT

RESEARCH and DEVELOPMENT news issue

SCIENCE and POLITICS don't mix... or do they? *see page 28*

Mammoth parts for Iroquois and other locks in St. Lawrence Seaway and Power Project depend on nickel alloy steels for prolonged service without repair.

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The opening of the St. Lawrence Seaway turns the Great Lakes into the world's eighth sea – giving us, in effect, a North American counterpart of the Mediterranean.

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In June 8 *Product Engineering*

ASSEMBLY METHODS

coming next week

the DESIGN issue

for June 8

FEATURING

- **Test gives relay specifications**
  Simple procedure uses standard relay as guide to new designs.

- **Investment casting . . . or sintered part?**
  The choice is easier after a close look at what the part must do.

- **Roundup of assembly methods**
  16 pages of illustrated how-to's that solve wide variety of problems.

- **Nylon's tough new rival**
  Plastic-rubber blend presents a low-cost challenge.

- **Designing 3-gear drives**
  New equations pinpoint the all-important dwell position

Product Engineering

McGRAW-HILL WEEKLY OF DESIGN, RESEARCH AND DEVELOPMENT

R&D Research and Development news issue

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Product Engineering ..... SIDELIGHTS

R&D Research and Development news issue

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Cold-war competition is probably the real reason behind the more-science-in-government movement (p 28). This was made especially graphic in a speech by Howard K. Nason, vp of Monsanto Chemical Co, at an ISA meeting this spring. Says Nason, "If we do not maintain leadership, both in theory and hardware, others will use technology as a lever to introduce and support their own economic and political policies . . . such is the challenge this nation's scientists face. Each of us has a competitor. Not some faceless, nameless group, but an individual engineer or scientist working on the same problems we are. It should concern us to think that this man may have greater resources or better training than we have."

When England's Royal Society was founded back in 1662 it was feared that a group with governmental backing might grow too strong. Robert Hooke, the society's curator, was asked to define the organization. He stated that the group was founded . . . "To improve the knowledge of all natural things–by Experiment (not meddling with Divinity, Metaphysics, Politicks, Grammar Rhetoric or Lagick)." Now that science and government maintain such a symbiotic relationship, wonder how the Royal Society would define itself today?

The psychologist has been turning his beady eye on research organizations recently. One even braved the scientist's wrath at the Basic Research Symposium in New York last week (p 21). One of our news editors, covering the symposium, met the psychologist accidently in the lobby and before he knew what had happened was knee-deep in conversation. His comments: ". . . tweedy suit, pipe smoke and friendly attitude–it's supposed to put you at ease but I was too scared to smoke, clear my throat, or even shift from one position. He looked at me as if my forehead was made of glass and every nasty thought was printed in big block letters on my brain. I used to think I was an ordinary man . . ."

ABP June 1, 1959

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Reader To Editor...

Cover in Dispute

To the Editor:

I consider the cover of the Apr 20 issue of PRODUCT ENGINEERING simply awful. That kind of artistry went out a long time ago and I suggest that you leave well enough alone and not revive it.

—PETER KYROPOULOS
Technical Director
General Motors Corp

To the Editor:

Your cover for Apr 20 is a masterpiece. This mismatch between little men and big machine; the oldness of the press and the inadequate dress of the men, etc.— these are well done! Do this more often.

—J P LAIRD
E I du Pont de Nemours & Co

What's New in Patents?

To the Editor:

In the Apr 20 issue of PRODUCT ENGINEERING, p 33, is an interesting article titled "What Happens to Patent Applications?" The author states, "Note that there has been no change in filing fee in 166 years." With all due respect to the author of the article here is some information—it pertains only to the filing fee and the final fee for a patent application.

Patent Act of 1790: Receiving and filing petition, 50 cents. Filing specifications, per copy-sheet counting 100 words, 10 cents. For making out patent, $2. For affixing great seal, $1. For endorsing the day of delivery to the patentee, including all intermediate services, 20 cents.

Patent Act of 1793: In full of all sundry services, $30. (Noted that this includes the filing fee and final fee which is paid at the time of filing the application.)

Patent Act of 1836: If the applicant shall elect to withdraw his application, relinquishing his claim to the model, he shall be entitled to receive back $20 of the $30 paid with the application. (This applies only until after the first action from the Commissioner.)

Patent Act of 1861: No money paid as a fee on any application for a patent shall be withdrawn or refunded. On filing an application, filing fee, $15. On issue of a patent, final fee, $20.

Patent Act of 1922: On filing application, filing fee, $20. On issue of patent, final fee, $20.

Patent Act of 1930: On filing an application, filing fee, $25. On issue of a patent, final fee, $25.

Patent Act of 1933: On filing an application, filing fee, $30. On issue of a patent, final fee, $30. —G O MATTER
Portland, Ore

Universal Drafting-language

To the Editor:

The ideas you expressed in the "Horizons" section of the Mar 30 issue, p 41, certainly are timely and well taken. Although the ultimate in a universal drafting language may lie at the end of the rainbow, a conscientious approach should be made. Here at Eli Lilly, we have embarked on a program of establishing engineering standards to cover design, materials, installation, and maintenance. Drafting, of course, becomes a primary element in this picture. Since a considerable amount of our work deals with outside contractors, suppliers, and consultants we would like our standards to approach the universal status you mention.

We are striving to improve our departmental training program so that it, too, will follow the same lines.

—W H SIMPSON
Indianapolis

To the Editor:

Your editorial in Mar 30 issue (p 41) PRODUCT ENGINEERING should be required reading for everyone concerned with drafting practices. At last, someone is putting a finger near the basic issue! Not on "simplified" vs "conventional" or ASA Y14 vs nonstandard practices, but on the simple fact that we have done practically nothing about our problem of communication. We try mightily to convince everyone of the value of a single language, when we might far better be concentrating some real effort on effective teaching of the many languages. —K M STOLL
Emporium, Penna

Wants to Sell Back-issues

To the Editor:

I would like to dispose of my complete set of PRODUCT ENGINEERING from June 1949 to the present for a nominal sum. These magazines are in very good condition and would make someone or an organization a very good reference file. Any suggestions would be appreciated.

—ROGER E SCHLEMMER
Cincinnati, Ohio

Some Ideas

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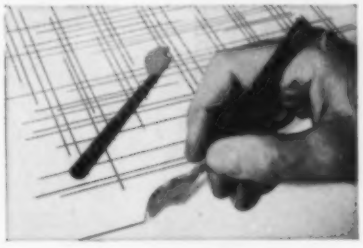
The K&E Quick Set combines the rigidity and precise adjustment of a standard bow compass, the simplicity and speed of a friction type compass, plus the finger tip control of K&E's unique design. You have to try the Quick Set to appreciate it fully. Two types are available. The N1071 fixed leg pencil compass, and the N1070 combination with interchangeable pen and pencil inserts. Both come with a box containing leads and spare needles. And with the N1070, a pen handle is provided for the pen insert which permits its use as a ruling pen. The compass can also be used as a divider by substituting one of the spare needle points for the lead in the pencil insert.



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K&E Marathon Long Line and Wide Line Ruling Pens (1092) hold an extra large ink supply – draw lines up to eight times longer than ordinary ruling pens. And because they are pre-set, line widths are always uniform, easy to match with complete accuracy. Ink flow is regular and even, lines are always sharp and clean edged.

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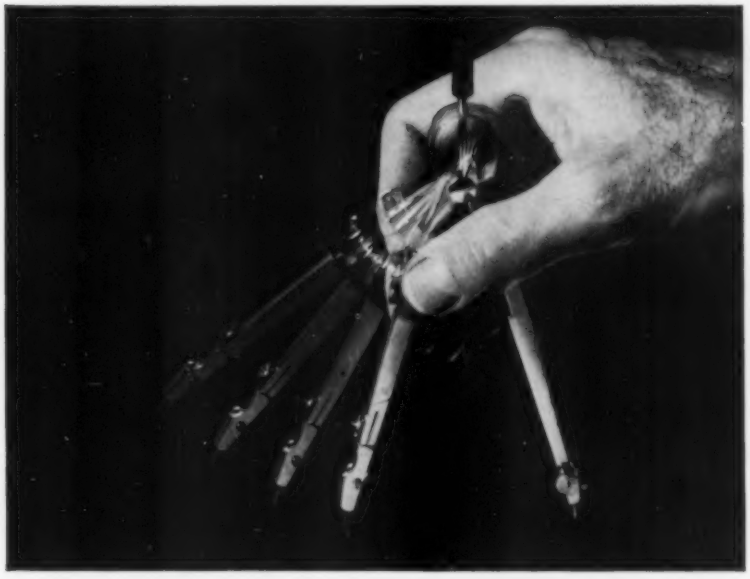
K&E Marathon Long Line Ruling Pens are available individually in line widths of .006, .009, .013, .020 inch – or in sets of three pens in line widths of .009, .013, .020 inch in a Leatherite case. Marathon *Wide Line* Ruling Pens come in line widths of .030 and .060 inch.



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A versatile new Leroy scriber is now available which greatly expands the variety of lettering possible from a standard Leroy template.

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1613

from rifle stocks...to bowling alleys...

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DEVELOPMENTS TO WATCH...

American

Wide-range multipurpose greases . . .

. . . with "built-in" extreme pressure characteristics can be produced by using calcium salts as thickeners, J. J. Kolfenbach and A. J. Morway of Esso Research and Engineering told the World Petroleum Congress. Previous attempts to make wide-range (75 to 400 F) greases with calcium salts were not too successful, they say, because high molecular weight compounds were used. It's the lower weight calcium acetates that provide the high level of lubrication efficiency in the new complex, and make the new greases "far superior to the lithium type" in ability to lubricate under extreme pressure conditions.

They further report that "the new calcium complex thickener is outstanding in its ability to retain a fixed consistency as temperature is changed." It shows essentially the same penetration at 400 F as it has at 100 F. A single grade of this product, they say, should be useful over "a temperature range which might normally require several grades of a conventional product."

A low-cost single-crystal semiconductor . . .

. . . that can be "mass-produced in large sizes" is claimed by Semi-Elements Inc, Saxonburg, Penna. Company president J. V. Fisher says the material has thermoelectric properties, could provide a "cheap, direct route to production of electricity."

At the present stage of development, Fisher reports, a ½-in. crystal of the material at room temperature will produce 25 milliamp at ¼ v; and over 100 milliamp at 1 v when heated to 300 F. He also says the material will pass current in one direction and prevent it from flowing in another "without any junction or any special preparation."

Composition of the material has not been revealed, but patent application is being filed, and the company expects to make the material available under license in about 60 days.

Finer finishes . . .

. . . can be obtained, says Minnesota Mining, with the aid of a new finishing material made by impregnating nylon web with adhesive grains. Used in buffing wheels or sanding belts, it is said to produce a high-quality finish on stainless steel and aluminum at a cost as much as 25% lower than with previously used materials. Furthermore, it seems to do equally well on titanium, zinc, copper and brass.

New nuclear batteries and luminous paints . . .

. . . should soon become a reality as AEC releases long-promised supplies of tritium, hydrogen's radioactive isotope, for civilian use *(PE—Dec 16 '57, p 5)*.

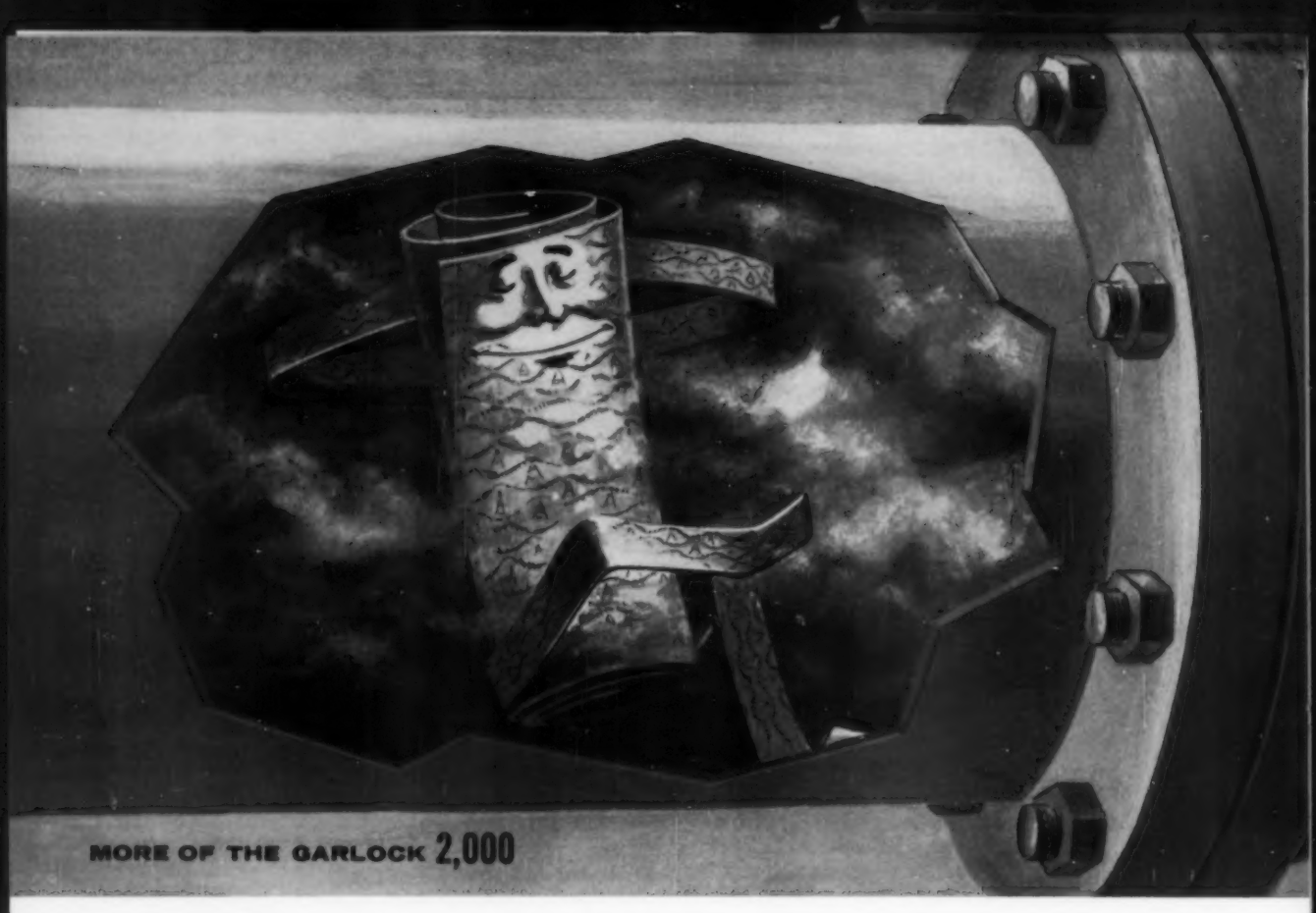
This isotope, relatively safe and long-lived, makes it possible to produce a wide variety of signs, markers, and other lighting devices that need no outside power source (the beta radiation from the isotope itself is used to activate a phosphor or semiconductor). It is also expected to permit design of more-dependable cathode-ray tubes (a small amount of tritium inside the tube will maintain partial ionization); and is being tested in fluorescent light tubes with the hope that it will provide a mechanism for elimination of starters, transformers, and other accessories.

Information on the isotope and how it may be procured is available from Oak Ridge National Laboratory.

Key to fatigue failure in bearings . . .

. . . is fiber orientation, says National Aeronautics & Space Administration. This is the crystal arrangement that results from rolling or forging. Says NASA: If the fibers are not oriented parallel to the axis of the cylinder from which the race or ball is made, the fatigue life is drastically reduced.

As one example, test cylinders with parallel orientation showed only 10% failures after 5 million cycles. With an 81 to 90° orientation (fiber lines at right angles to the cylinder axis), 80% failed at less than 3 million stress cycles. This is part of a continuing research program, aimed at uncovering causes of fatigue failure in sheet materials as well as formed components. —ARG



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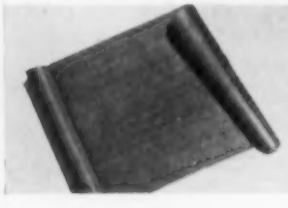
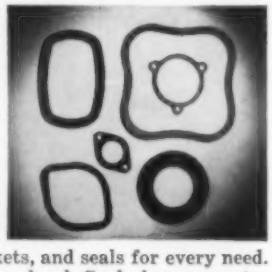


For Solvents and Oils to 300°F. Garlock neoprene bonded compressed asbestos sheet is excellent against solvents and oils to 300°F. Good compressibility and resistance to heavy bolt loads without excessive plastic flow. Available in style 7228 made from long fibre Canadian asbestos with high tensile strength; or in lower cost style 7098 made from medium length asbestos fibre. Both styles available in thicknesses from $\frac{1}{64}$" to $\frac{1}{8}$".



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DEVELOPMENTS TO WATCH...

World-wide

Another new plastic in the polyethylene series . . .

. . . will soon reach commercial production at Montecatini of Italy. This is polybutylene, third in the olefin series that started with polyethylene and now includes polypropylene (*PE*—Aug 11 '58, p 12; Sep. 29 '58, p 36).

Intermediate in stiffness and tensile strength between linear polyethylene (*PE*—Nov 18 '57, p 17) and isotactic polypropylene, the new material is said to have a softening point slightly higher than either of the other two (above the boiling point of water). Its resistance to transformer oil, sulfuric acid, and sodium hydroxide is very good. It is softened by gasoline and benzene; but, as Giulio Balabio pointed out in discussions at the World Petroleum Congress, this may be preferable to the stiffening which occurs in the other two polymers.

As to specific properties, isotactic polybutylene has a Vicat softening point of 212 to 230 F, as compared to 201 to 208 for polypropylene, 180 to 190 for linear polyethylene. It's crystalline melting point is 260 to 270 F, as compared to 325-335 and 265-280. Dielectric constant at 1 mc/sec is about 2.1.

Explosives may put powdered metals together . . .

. . . instead of forcing metal fragments apart.

Prof. Georgi Pokrovsky of the Soviet Academy of Science predicts that tubing and even fully formed components will be made simply by casting explosives in the shape of a mold, filling the mold with powder —and blowing the whole thing into form.

While this idea may be a bit far-fetched, at least two companies in the US are experimenting with explosives as a method for compacting hard-to-compact powders (special alloy mixtures particularly), using methods that are an extension of already proved explosive techniques (*PE*—Apr 13, p 62).

Silicon power transistors in unusual shapes and types . . .

. . . with current ratings of 1 amp and more are in "an advanced stage of development" at Mullard Ltd, England. These are alloy junction transistors, but made of special alloys in such shapes as doughnuts.

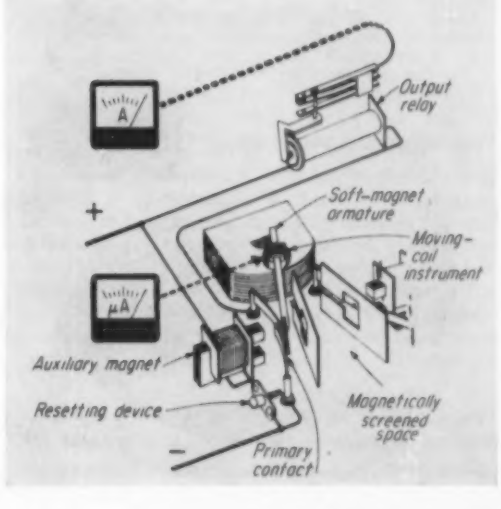
Also under development at Mullard: a tape-reader using silicon photo-voltaic devices and a silicon transistor-driven ferrite "memory" operating at a repetition frequency of 100 kc/sec.

New relay, featuring amplifications to 1×10^{10} . . .

. . . between input and output circuits, is claimed by P Gossen & Co, Erlangen, Germany.

Described as an "electromagnetic contact-force amplification unit," it consists of a moving-coil measuring unit, carrying a small soft-magnet armature. Under normal conditions, this armature stays within a magnetically screened space (see diagram). When, however, preset limits are exceeded, the armature moves out and into the field of an auxiliary magnet, activating a primary contact placed in its path. In effect, then, the primary contact is "spring-loaded" by the moving armature; and the attractive force of the auxiliary magnet amplifies the low contact pressure of the moving-coil device.

When it closes, the primary contact operates a slave relay in the output circuit which operates the main power contacts. —ARG



Electromagnetic amplification is major feature of German-designed relay. Moving armature is at center.

(*Advertisement*)

Kodak reports on:

60,000 inches per second without a break . . . electronics through joy . . . a nice material to coat with photographic emulsion

Contest

NEW: Kodak Linagraph 77 Paper. In one popular make of oscillograph (undoctored), it has recorded without a break a line written on it by a spot of light moving at 60,000 inches per second.

ALSO NEW: Kodak Linagraph 44 Paper, for any application of paper-eating oscillographs where extra blackness and contrast of the line are worth accepting one-fourth the speed of Linagraph 77 Paper.

Queerly enough this field, the very existence of which is probably unknown to 99% of the population, is one in which corporate giants manfully smite each other hip and thigh with a vigor that even Detroit would enjoy. Now that we have rearmed ourselves with the two magnificent weapons named above, the mere innuendo that the foe can even approach us in generating customer satisfaction will cause our nostrils to flare.

Technologically the problem reduces to the spreading of a superior light-sensitive emulsion in a superior manner on a superior paper stock thin enough to take longer recordings between reloadings and strong enough to stand stabilization processing. This widely used and rapid but rigorous machine method we had the honor to invent.

Anyone practicing paper oscillography would be cheating himself not to seize the opportunity afforded him (as a judge in the contest) to improve the appearance, readability, and reliability of the records he turns out. Either the Kodak dealer who regularly serves him or Photo Recording Methods Division, Eastman Kodak Company, Rochester 4, N. Y., can furnish all pertinent details about Kodak Linagraph 77 *and* 44 Papers.

TV—rugged and sophisticated

Loath to fight World War III in an ad (though this may not be a bad place to fight it, personal safety considered), we can only generalize from the concept that to place a living human eye at the payoff end of an intricate and talented optical device may be inconvenient and unwise. Where the environment is too violent for the eye, we have developed a knack for substituting a television camera.

This calls for cameras more sophisticated than those which read boxcar numbers in remote corners of railroad yards. We take pickup tubes (drinking deep draughts of the knowledge of their manufacturers, just as they are welcome to milk us when it comes to photography) and festoon the tubes with electronic circuitry, optical elegance, and precision-mechanical musculature—all neatly woven together. The whole we put in small packages. We can make the packages do their duty gracefully under 15 g's of shock and 145 db of acoustic energy in each octave to 20,000 cycles/sec for x minutes at 200°F or y hours at −65°F after z months of storage at −80°F.

How did we happen to get electronically involved? Well, the biggest part of our business has always been ways and means of presenting an image to the eye. Electronics engineers we have in goodly numbers on such projects as machines that take a very quick look at a Kodacolor negative and instantly reach a complicated decision on how to vary some colored light beams to bring the greatest joy to the

lady calling for her Kodacolor Prints. With what such machines cost, they have to work when you turn them on. Like virtue, reliability becomes its own reward. This viewpoint our electronics engineers must quickly acquire.

Another corps of Kodak electronics engineers bring to TV-systems development the experience of packaging radio transmitters and receivers to work inside artillery shells. This, too, we got into from catering to the public's photographic desires. The armed forces had figured that an outfit capable of flooding the world with accurately timed photographic shutters could do as well with artillery fuzes. Later, when fuzes came to be operated by radio echoes instead of clockwork, what was more natural than that we make that kind?

If you have some business to discuss about rugged and sophisticated electronics, get in touch with Eastman Kodak Company, Apparatus and Optical Division, Rochester 4, N. Y.

Flatness

Complexity, complexity! Rest the mind on a simple product, a photographic-emulsion-bearing rectangle 5.0 millimeters thick, 190 millimeters wide, 215 millimeters long, and flat within 0.00002-inch per inch. We mean: **Nowhere on the surface bearing the emulsion will it be possible to draw a circle of one-inch diameter containing a point of the surface more than 0.00002-inch distant from the plane of the circle.** Though achievement of such flatness is not simple, that is none of the user's business.

The user's business is to know the path of a man-made object moving across the sky and to know it with the best precision that man can currently master for the task. The work requires dimensional constancy of the material which bears the image.

That material is glass, a substance known to the Phoenicians and since improved. Our kind alters its linear dimensions by 0.00045% for each degree Fahrenheit of temperature change. Polyester, the most dimensionally stable of commercially available plastics, is called "stabilized" when its temperature coefficient is brought down to twice that. For the hardened steel from which gage blocks are made, the linear expansion coefficient is down to 0.00056%. Steel is opaque and does wicked things to sensitive emulsions.

George Eastman quit his job as a bank clerk in 1881 when he found he could coat emulsion on glass and sell it. That's how our whole business started. Don't think of the photographic plate as an antique, however. To find out how wrong that would be, try putting a question to Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y. For one thing, you could ask about those ballistic camera plates announced above.

Kodak

This is another advertisement where Eastman Kodak Company probes at random for mutual interests and occasionally a little revenue from those whose work has something to do with science

DEVELOPMENTS TO WATCH...

Washington

Solid-fueled Polaris missile...

according to Navy spokesman, can be boosted up to 3,000-mi ranges within the next five years. Right now, the missile is slated to go into service sometime next year with a 1,200-mi range.

On May 8th, the Polaris missile went through a virtual, full-scale firing from Cape Canaveral, Fla. Results, the Navy says, were 100% successful. The only thing not tested in the missile–dubbed AX-8–was nose cone re-entry and full range flight. Range, for test purposes, was held to 750 mi. Re-entry has already been tested.

With the Polaris performing so well, the Navy is now plugging hard to get the program accelerated. The pressure is being exercised unofficially, but there is no question about the Navy's wanting the program boosted in size to obtain the new range.

Actually, Navy wanted $1.4-billion for the Polaris program in fiscal 1960–the year beginning July 1–but it was cut back to $611.5-million.

Navy is plugging its Polaris missile system for another reason, too. The admirals are miffed at recent Air Force proposals that the Polaris launching submarines be placed under Air Force control as an extension of the Air Force's strategic air command.

Navy is trying to show that its long-ranging nuclear subs armed with the Polaris missiles are a better dollar investment to the defense of the nation than the air-launched IRBM's that the Air Force plans to build for its heavy bombers.

The tariff commission...

in a case involving Singer sewing machines, has reaffirmed that it will not try to determine whether patents on imported products are valid. The commission refused to go into the full patent history of an imported Japanese model, pointing out that the commission must accept the validity of a patent unless it is upset in the courts of the US.

But the commission will still explore technical questions to determine whether the imported sewing machines are sticking to the mechanisms spelled out in their patent grant. Singer claims the Japanese imports infringe on Singer's domestic patents. The commission says its ruling is consistent with past cases involving US and foreign patent claims.

Custom-made inventions...

The Armed Forces have called on industry to come up with inventions on some 28 items it needs. The inventions range from a rocket lift device to propel individual soldiers across rough terrain to new instruments and electronics components.

The plea, issued through the National Inventors Council, is an addition to a long list of other inventions wanted by the military. A detailed list of the military needs can be obtained by writing to the National Inventors Council, US Dept. of Commerce, Washington 25, D. C. (See *PE*—May 18 '59 p 56).

Persons who think they have a solution to any of the problems can send the idea to the NIC where it will be given preliminary evaluation and turned over to the proper military agency for final approval.

Specific examples of the new inventions wanted include: an ocean wave measurement gage to measure the height of large waves up to 75 ft, pressure sensing devices, vibration isolation equipment, and self-restoral submarine cables for deep ocean use.

Development of high-energy accelerators...

is getting more top-level attention in Washington. Pres. Eisenhower has already announced plans for federal construction of a two-mile-long electron accelerator at Stanford Univ costing $100-million (See *PE*–Apr 21, '58 p 16). But this may be just the first step.

White House advisers are recommending a $135-million program by 1963, compared with current yearly expenditures of $60-million. The big need is for a high-intensity electron accelerator of 10- to 15-billion electron volts–the Stanford facility will fulfill this requirement–and a high-intensity proton accelerator in the 8-BEV range.

The whole idea is to increase the emphasis on basic vs applied research in the US, lest the US fall behind in the world scientific race (see p 21). To coordinate the efforts of the Defense Department, Atomic Energy Commission and National Science Foundation, Eisenhower is being urged to create an interdepartmental council for the study.

WHAT'S HAPPENING IN... Science

Pyrometallurgy: New engineering tool

Molten metals and salts can open new routes to nuclear power, permit development of new types of batteries, and provide better methods for separating and reclaiming valuable elements.

That's the news coming from scientists and engineers across the country. Nothing new about many of the ideas they are now proposing; but the implementation these ideas are now receiving makes them top news today.

For instance, pyrometallurgical techniques, in which molten metals instead of solvents are used for separating uranium fuel elements from their zirconium cladding and for recovering rare earth metals, are in the pilot stage, with full-scale equipment being designed. The processes are simpler, faster, and pose far fewer waste-disposal problems than any of the aqueous systems now used.

At the Electrochemical Society meeting a few weeks ago, B. R. Sundheim of NYU described thermocells —potential power producers—in which molten salts or molten metals, in paired cells maintained at differing temperatures, may be made to generate electricity by virtue of the Peltier effect (*PE—May 4, p 28*). Several commercial companies are now working on this development.

In addition to uranium fuel processing, potential reactor applications for liquid metals include heat transfer, and uranium fuel "carriers" for "homogeneous" (liquid phase) reactors.

As metallurgists from Battelle Memorial Institute point out: "We are on the threshold of a new field of endeavor. . . . While many pyrometallurgical or pyrochemical processes have been delineated . . . only the surface has been scratched. . . . But this field of endeavor, which has been scientifically interesting for 15 years, now becomes economically interesting."

Much in the way of thermochemical, electrochemical, and physical data remain to be obtained. But this, too, is on the way. The NY Academy of Sciences, for example, just held a full-scale, three-day technical conference on molten salts that attracted scientists from all over the world and produced many basic reports. Papers from this symposium will be published shortly.

Organizing the atom's core

The once-solid atomic nucleus has now been broken down into so many particles that even keeping track of them is becoming a headache. Good news, then, is the effort now being made to "organize the unorganized."

About a year ago, at a meeting of the NY Academy of Sciences, John Grebe of Dow Chemical Co proposed a "periodic table of nuclear particles," similar in concept to the periodic table of elements first proposed by Mendeleev. At that time, there were a good many raised eyebrows—and a good many holes in the theory. Now, though, those holes are being filled in and Grebe's ideas are gaining considerable support.

Briefly, Grebe suggests that the fundamental particles (positrons, mesons, hyperons, and so on) may be considered as consisting of "spinning charges . . . being pulled into the smallest possible path by a pinch effect." Such charges, he says, "surge around one another as do particles in a vortex." The diameter of this vortex then represents the length of an "all-pervading standing-wave space lattice." Based on this lattice, Grebe has postulated 28 energy levels or shells at which the charges can exist; and, based on the number and location of energy units in these levels, he has set up his table of organization for the nuclear particles.

Much remains to be done to refine the theory and obtain background data; but it now looks as though the idea of organizing nuclear particles and predicting the performance of nuclei containing them is, at least, off to a good start. —ARG

New way to show stress

A circular polarizer and a reflective coating are helping Naval Research Lab engineers study stresses in the transparent plastics used for aircraft glazing and similar applications.

The reflective coating—sprayed aluminum paint or "silvered" polyester film—is applied to one side of the sample and light is played on the other in such a way that both incident and reflected rays pass through the circular polarizers. This then sets up a fringe pattern that indicates relative strain (see photo).

(Note: For more on stress analysis, see *PE—Jan 26, p 12, Mar 2, p 43, May 18, p 22* and earlier references.)

Reflected light shows up stresses at fastening points in transparent materials. Top and bottom screws have been tightened; center ones are loose.

WHAT'S HAPPENING IN... Materials

Translating steel specifications

Designed-in-America products can be converted into European alloys without too much difficulty, M. S. Northup and A. R. Ciufreda of Esso Research and Engineering told the World Petroleum Congress. But the job of design conversion will be easier if the engineer recognizes the differences that exist and takes advantage of the European national standards, particularly for the carbon-steel grades. (Alloy steels are not as well covered, and may require special negotiations.)

Biggest difference between American and European steels stems from the fact that the bulk of continental European steel is produced in Thomas converters instead of open-hearth furnaces; and Thomas steels are generally not as uniform or as able to stand shock and dynamic loading as are the open-hearth types. However, the Europeans are working hard to improve the quality of their steels by using oxygen instead of air to reduce nitrogen pickup, adding aluminum to control the effects of nitrogen in air-blown steels, reducing the phosphorus content, and providing for better over-all processing control. In some cases at least, the Esso engineers say, European steelmakers are now able to produce Thomas steels whose notch toughness, aging characteristics and weldability are comparable to open hearth grades.

As far as specification procedures go, there are still a good many differences between American and European practice. Among the most important, as outlined by Northup and Ciufreda:

- Mechanical characteristics guaranteed in most European specifications are broader than corresponding ASTM specifications. Certain steels, for example, may be guaranteed not only for room-temperature impact strength but also for certain high-temperature properties.
- European specifications require that test specimens be taken transversely to the direction of rolling rather than longitudinally as in ASTM specifications. The European method, the Esso engineers believe, offers at least one advantage: It gives a better indication of the minimum tensile properties.
- Chemical composition is not as sharply defined as is the practice here. Many European specifications restrict only such undesirable contaminants as phosphorus and sulfur.
- European mills tend to demand more liberal tolerances on thickness and weight than are found in our specifications. However, European practice does seem to be moving closer to American standards as time goes on.

Watch these "standard" samples

The importance of testing materials in the form in which they'll be used is reemphasized by two examples from a Navy Lab.

In flame tests of electrical insulating tubing, they found several instances where the smallest and largest sizes both burn more slowly than the intermediate size. Thus, a sample in the mid-range may seem unacceptable while one just a little larger or smaller —made of exactly the same material— may meet specifications. The explanation seems to lie in the relationship of diameter to wall thickness; and the solution in this case involves adjustment of the test procedure as well as reexamination of the material.

In fungus tests, too, the Navy tests all sizes. They've found cases in which king-size plastic tubing is not attacked; but "identical" small-bore tubing supports fungus growth. One reason, apparently, is the problems in extruding the smaller sizes. The special techniques that are sometimes used may result in adsorption of nutrient materials on the tube wall, providing a medium for fungus growth.

(Note: Look for more on flame resistance in forthcoming issue.)

New yarn to improve rubber parts

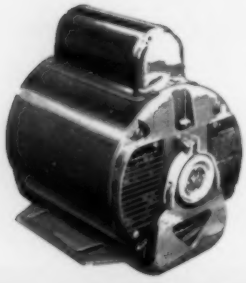
Mechanical rubber products can be given "higher strength per dollar" with a new adhesive-finished, high-tenacity rayon yarn, says DuPont's Textile Fibers Dept. This yarn is said to offer a number of processing advantages, including longer shelf life, as compared to the previously available resorcinol-treated (RFL) cord. DuPont says the new 272-F yarn shows excellent adhesion to many rubber stocks, including GR-S (SBR) and GR-N (NBR), and retains its adhesion unusually well when wet. The company is now ready to supply it for conveyor belting, hose, and similar products.

briefs . . .

Magnesium alloy, claimed serviceable on a long-term (1000-hr) basis to 450 F, with short-term (10-hr) resistance to 600 F is offered for evaluation by Dow Chemical Co. This is a sand-casting alloy that incorporates the rare earth metal didymium. Dow says it can be welded and forged, takes standard magnesium finishes. Composition is: zirconium 0.6%; didymium, 3.2%; bal. magnesium.

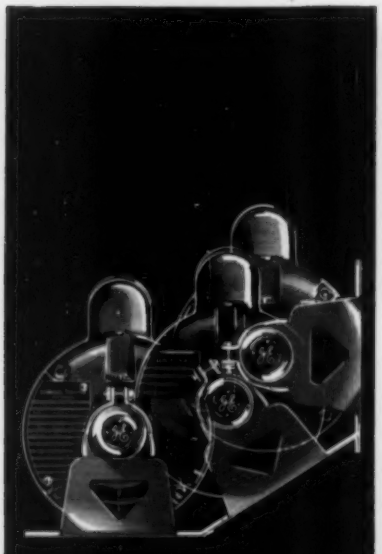
Corrosion-preventing varnish, so effective that "one coating gives the same protection as three of conventional types" is claimed by Th Goldschmidt AG, Mannheim-Rheinau, West Germany. Key to the success of this two-component mixture is apparently that it is "almost solvent-free," can be applied in "unusually thick layers."

Electrical insulating tubing that's clear and colorless, remains flexible to −75 F, is announced by Resinite Dept, Borden Chemical Co, Santa Barbara, Calif, and North Andover, Mass. Pointing out that the tubing's clarity should make it easy to read system markings and color codes on contained wires, Borden suggests automotive and aircraft applications. —ARG.



DESIGN ENGINEERS...

SIX WAYS

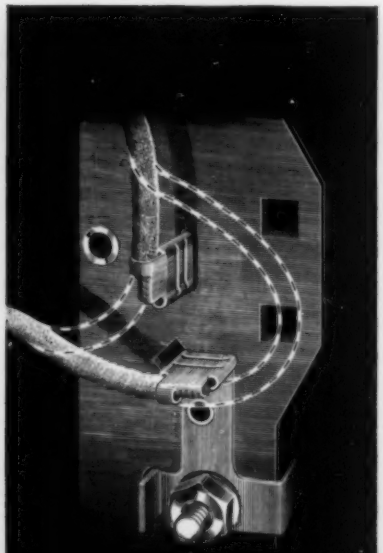


MOUNTING VERSATILITY

Cradle bases, both solid and resilient, allow rotation within base

You can rotate the Form G motor within the cradle base to take advantage of its drip-proof design, or you can position the motor with the capacitor at various angles for tight-squeeze applications. Or, you can remove the cradle base if you don't need it for your application. G-E Form G mounting versatility can mean greater design flexibility for you!

GENERAL ELECTRIC



FAST ROTATION CHANGE

Now you can reverse Form G shaft rotation in less than 10 seconds

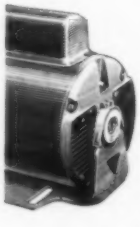
No need to specially order motors to meet your rotation requirements. G.E.'s Form G motor features a new wiring method that lets you change rotation in seconds. Quick connectors make the change fast and positive. Just interchange the two motor leads on the terminal board. That's all. Require fast, easy rotation change? The Form G is your motor!

GENERAL ELECTRIC

EASY, DIRECT MOUNTING

Close end shield tolerances allow direct mounting without costly machining

General Electric standard Form G's can be mounted directly on your product without expensive machining or costly brackets. Close end shield tolerances, plus inherent shaft-to-end shield concentricity, lets you mount General Electric's Form G's with simple through bolts. This feature could be a real money saver for you. Why not investigate it today?

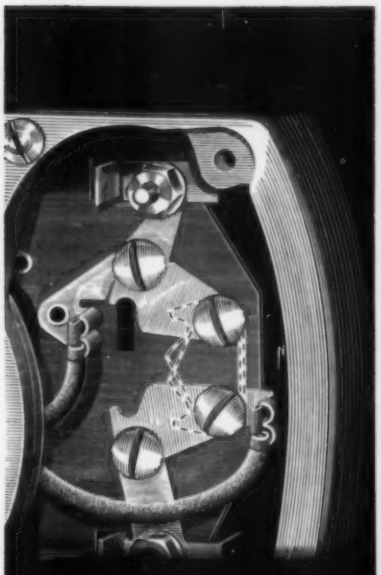


GENERAL ELECTRIC

JUST ASK YOUR GENERAL ELECTRIC SALES ENGINEER

Cut costs with General Electric Form G motors . . .

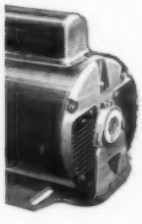
MORE VERSATILE



FAST VOLTAGE CHANGE

Unique sliding plates on terminal boards make voltage change simple

Reduce inventory, simplify ordering! You can change General Electric Form G motors from 115 v to 230 v operation (or vice versa) in 1/5th the time, without confusion and error. No special tools required! A screwdriver is all you need. Just loosen the four screws, pivot the plates to the new position and tighten the screws. That's all there is to it!



ALL-ANGLE OPERATION

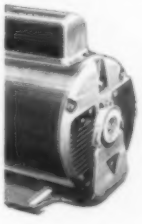
Special bearing and oil retention system permits mounting in any position

Mount it horizontally, vertically—even upside-down—the new Form G has the versatility to match the design and space requirements of your product. An advanced bearing and full oil retention system allows you to mount the Form G in *any* position and still be sure of getting faithful motor performance. In any position, Form G's do the job!

COMPLETE LINE

Full line of Form G's means the right motor for every application

There's a standard Form G motor to meet your exact product requirements. No need for costly specials. Over 850 basic models—and thousands of variations—are available on a mass-production basis. Let your General Electric Sales Engineer show you the all-around versatility of Form G motors and how they can provide important savings for you!



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GENERAL ELECTRIC GENERAL ELECTRIC GENERAL ELECTRIC

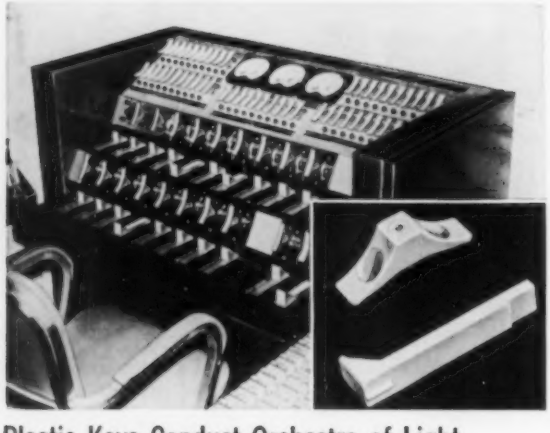
ABOUT THE NEW FORM G "EXTRA VALUE" FEATURES

CYANAMID

PLASTICS IN ELECTRICAL DESIGN

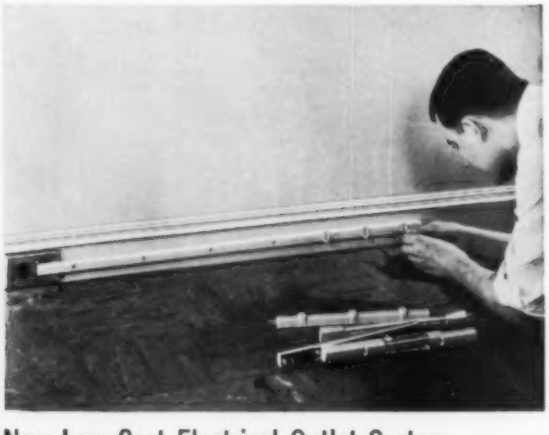
An Ounce of Protection

KLIXON precision aircraft circuit breakers have to be light; yet even the smallest, weighing about 1¼ ounces, can safely interrupt a 120-volt ac, 400-cycle circuit delivering over 4000 amperes. To provide the high arc resistance and great physical strength required, Spencer Thermostat Div., Metals and Controls Corp., uses glass-filled CYMEL® melamine plastic housings. These non-corrosive housings are excellent insulators and stand up to impact, humidity, dust, temperature extremes and fire.



Plastic Keys Conduct Orchestra of Light

The Lumitron Lighting Control System permits one operator to play infinite variations in stage-lighting effects using handles and slide bars molded of BEETLE® urea plastic. BEETLE, an excellent dielectric, requires no insulation. Molded-in colors are permanent, permit quick circuit identification for console operator. Developed by Metropolitan Electric Manufacturing Company, the Lumitron has an excellent record of dependable performance.



New Low-Cost Electrical Outlet System

Made of ivory-colored BEETLE urea molding compound, new interlocking foot-long units provide low-cost, easily installed electrical outlet extensions. BEETLE combines good mechanical and dielectric properties for safe, dependable service, meeting ASTM Specifications D705-49, Grade I. Made by Cable Electric Products, Inc., this new Snapit Inter-Link System is fully approved by Underwriters Laboratories, Inc.

CYANAMID

AMERICAN CYANAMID COMPANY
PLASTICS AND RESINS DIVISION
40A Rockefeller Plaza, New York 20, New York

In Canada: Cyanamid of Canada Limited, Montreal and Toronto
Offices in: Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Detroit • Los Angeles • Minneapolis • New York • Oakland • Philadelphia • St. Louis • Seattle

Product Engineering

HORIZONS

June 1, 1959

"You gotta accentuate the positive . . .

. . . eliminate the negative"—so run the words of a once-popular song. So, too, run the thoughts of sales-minded executives: Lead from strength, talk up your strong points, think positively, look on the bright side.

The American public is deluged with the power of positive thinking. And the engineer, the only "No" man left, has an unpopular point of view. He's a Gloomy Gus, a calamity howler. Long gone is the concept of balance, the application of the counterforce, the equal and opposite reaction. We strive for the biggest—and discount the probability that it is also the clumsiest and most costly, or the smallest—and discount its probable weakness. Only the engineer seems to remember that with mass goes weight, with lightness goes instability, with quality goes cost, with specialization goes inflexibility.

The positive is not automatically preferable. In the case of the midnight prowler, the virgin or the reported catastrophe, the negative condition is the virtue. And what of the negative ion, without which the atom could not exist? Or the negative number, power, angle in mathematics—even subtraction itself?

These ideas are suggested by our tendency to carry positive thinking into exaggeration. The new product arrives on the market with no mention of developmental problems, testing limitations, application requirements. The unsolved problem—in missile, cancer, space ship—is assumed to be merely a matter of money. In the plant, if one engineer can't work it out, put two, three or ten on the job. In the laboratory, accelerate the scientists. Or hire a consultant or an "expert." Somehow we've confused money with brains and with ability, brain-storming with breakthrough.

We need to rediscover that negation—in laboratory, engineering department, plant or nation—has its virtues. Perhaps a few solid, thundering "No's!" will restore balance.

Peale may plank for positive thinking
And salesmen accentuate the plus
But scientists, with senses sinking
Are negatively industrious.

Refrain

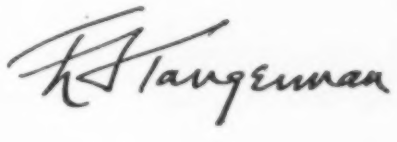
Negative ion, rocket's chatter
Antimissiles and antimatter
Semiconductors electron holed
Cryogenic's ultra-cold.

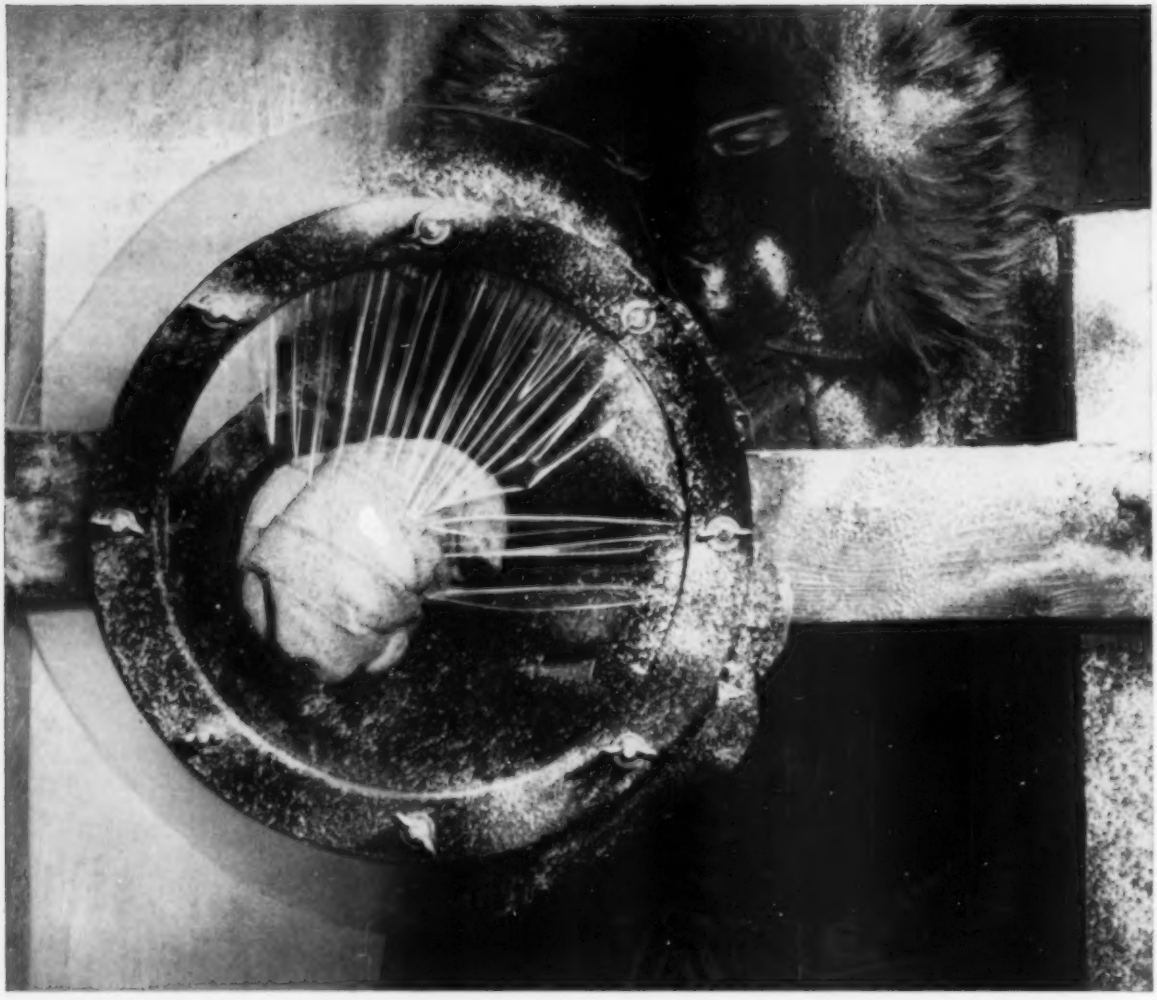
One day when passing a computer room
I heard a console whisper loud
With a hollow voice that sounded doom
"Every silver lining surrounds a cloud."

Refrain

Vacuum pumps and negatrons
Antibodies and antigravity
Ultra short-lived u-meson
Obviously, it's all depravity.

—Richard M. Koff





MYLAR® retains its high strength at -60° C.

Can the unique combination of properties found in "Mylar" help you solve your design problems?

Weatherable "Mylar" Type W-2 resists ultraviolet light. This new film, with all the outstanding properties of regular "Mylar", is specially treated to withstand the sun's ultraviolet light. The film offers new design opportunities for outdoor applications.

"Mylar"* polyester film is a tough, flexible engineering material. In addition to its resistance to temperature extremes (-60° to 150°C.), "Mylar" has an average tensile strength of 20,000 psi, a dielectric strength of 4,000 volts per mil for 1 mil film, plus excellent resistance to most chemicals and moisture.

On an area basis, tough, thin "Mylar" often *costs less* than heavier, conventional materials. "Mylar" can be laminated, embossed and metalized, punched or coated. The film won't embrittle with age. "Mylar" is available in roll or sheet form in a wide range of gauges.

Find out how the *combination of properties* in "Mylar" can help you solve knotty design problems, improve product performance or cut cost. Write today for our new booklet containing detailed information on properties and applications. E. I. du Pont de Nemours & Co. (Inc.), Film Department, Room P-6, Wilmington 98, Delaware.

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BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

DU PONT **MYLAR** POLYESTER FILM

Scientists Seek Support for Basic Research

NEW YORK—Ways and means of enlarging the nation's output of new knowledge were examined here at a three-day Symposium on Basic Research which brought together 250 of the nation's top scientists.

Statements by twelve symposium participants reiterated the theme that the US must find means for supporting gifted individuals who are relieved from pressure to solve immediate problems and are free to unearth heretofore unrecognized possibilities in nature. Without such commitment of human resources, technical imaginations will be stunted to the limits of what is known today. The symposium was sponsored by the National Academy of Sciences, The American Association for the Advancement of Science and the Alfred P. Sloan Foundation.

Support for basic research is hard to get, symposium members agreed, because it is impossible for the free-wheeling individual researcher to trace in advance step-by-step measures necessary to invade the unknown. Nevertheless a variety of proposals was forthcoming.

The federal government now sponsors $320 million of basic research or about ½ of all such research in the US, Dr. Alan T. Watermann, director of the National Science Foundation declared. On the whole, he said, the government's role has been enlightened. Nevertheless, government has awarded grants for special research programs that pay insufficient attention to the general health and growth of educational institutions that provide major volume of research. Support of special projects has often disturbed the normal balance of research in receiving institutions. Further problems arise because the government fails to pay the full cost of research, thereby causing the schools financial strain. Dr. Waterman urged greater government support for areas of science, rather than special projects.

PROPOSES TAX CHANGE

Dr. Paul E. Klopsteg of the National Science Foundation announced that a bill is now before Congress to encourage greater support of private educational institutions by the general public. This bill would amend the income tax law so that taxpayers could take a tax credit of 91% on gifts to educational institutions up to 15% of their adjusted gross income. For the taxpayer, this makes the cost of giving amount to 9¢ per dollar. Under present schedules, Dr. Klopsteg said, the cost of giving is inversely related to ability to give. Extremely high income bracket people can now give at a cost of 9¢ per dollar given. But for people in the $5,000 to $50,000 brackets the cost ranges from 41¢ to 78¢ per dollar.

Additionally, the bill proposes that donations to higher education would be equalized among corporations. These organizations would be permitted to give up to 10% of taxable income, on a tax credit basis, at a cost of 48¢ per dollar. Such tax concessions, Dr. Klopsteg predicted, would encourage colleges and universities to step up campaign for funds.

PROFESSOR WOES SELF-INFLICTED

Three educators addressed the Symposium on the problems of private universities, state universities and liberal arts colleges in fulfilling research needs. The greatest threat to private educational institutions that accept government contracts comes from panels and advisory committees—chiefly professors—who pass on budgets not from the agency that supplies the money, Dr. Lee A. DuBridge of California Institute of Technology charged. These panels, he said, oppose proper overhead allowances on research contracts and allowances for salaries of professors working on projects, and they require elaborate reports that suppress daring ideas. Failure to pay full cost of research causes considerable hardship on the private schools who must depend upon endowment funds and tuition to cover their operating expense.

The greatest expansion of facilities and personnel for the nation's basic and applied research should come within the university framework, Dr. C. A. Elvehjem, president of the University of Wisconsin, stated. To fulfill their mission, the universities must be able to establish programs on a long-term basis. This means government grants must provide funds for overhead and new facilities. Dr. Elvehjem also urged establishment of research professorships to assure tenure for outstanding scientists. Such professorships, he said, could relieve scientists of formal teaching responsibilities and would help develop competent graduate students who assist them.

The nation's liberal arts colleges discourage basic research, Dr. Laurence M. Gould, President of Carleton College charged. He laid blame on administrators and trustees who fail to see that basic research is important and makes better teachers. Dr. Gould cited a questionnaire to a cross-section of small college administrators. It showed that only four of fourteen schools consider time devoted to research when planning teaching loads. Another survey of 650 liberal arts colleges indicated that only 30 were productive sources of graduate students. Dr. Gould deplored this poor performance by schools that potentially offer advantages of flexible departmental boundaries, which encourage research in overlapping areas, and also offer quiet atmosphere conducive to research.

LIFE RESEARCH GRANTS

Discussing the role of the private research institute in basic research, Dr. Merle A. Tuve of the Carnegie Institution in Washington stated that his institution buys a man's time, then gives it back to him. He deplored the superficial character of much "basic" research today and said that the policy of the private research institutes, such as his, can provide a model for the support of basic research. Really creative work, he said, is done by individual investigators in environment of reasonable austerity—that is in environment free from the large teams and huge facilities.

Congress, he insisted, should be made aware that there are specific and identifiable individuals whose lifetime efforts could be safely underwritten in advance. A lump sum of $700,000 could pay the life salary for a 30 to 35

year-old-person who had been identified as a creative individual. Allocation of $40 to $60 million a year could produce a solid phalanx of 500 to 600 outstanding investigators who could devote their entire effort to creative ideas. Over a decade, the cost would be half that required to finance one year of our current space rocket activity.

The large lab can be as stimulating as the small—perhaps even more so according to James B. Fisk, president of Bell Telephone Labs, who discussed the role of industry in basic research. There are two reasons for this, he said: Specialists need associates in the same area to keep themselves professionally sharp. And scientific creativity flourishes with a judicious mixture of disciplines. Such mixtures generally produce fruitful interactions. The interaction of reseach workers with development is likewise important, Fisk declared. The research worker must "keep the thinking straight." He reduces empiricism and infuses development activity with scientific mood.

SCIENCE, TECHNOLOGY INSEPARABLE

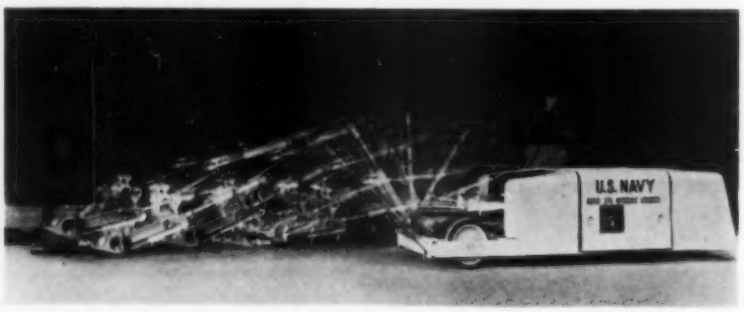
The question of defining basic reseach, a nettlesome one for scientists who would advance its cause, was touched on by several of the speakers and quickly dismissed by Dr. Robert Oppenheimer, director of the Institute for Advanced Studies. Dr. Oppenheimer stated that science and technology are symbiotic and to make a sharp distinction between them is "academic and dreary." Technology, he said, would be blinded, impoverished and crippled without new knowledge that is sought and found for non-practical reasons. Technology gives back to science a rich reward in new instruments, new techniques, new powers. The feedback is so constant that probably no lab should be so dedicated to its practical mission that it cannot devote a fifth to a sixth of its work to unrelated research.

On a more general plane, Dr. Oppenheimer saw a great challenge for society to restore a balance between what is known in science and what is part of the common culture. Sscientists must fulfill a role as teachers if the public is to have scientific understanding, and if the public is to create political institutions capable of coping with advancing technology. ■

Develop Missile Loader for Navy:

Will Have Industrial Applications in Future

ROCKVILLE, MD.—A prototype of a mechanical missile loader has been developed by American Research & Manufacturing Corp. here for the US Navy as a means of semi-automatic loading of missiles onto carrier-based aircraft. Called the ARM-Corp Automotive Manipulator, it is a low, 4-wheel vehicle that can hoist, turn, slide, rotate and cradle a missile in any motion or direction desired. Self-propelled with a 14-hp gasoline motor, the device weighs more than 2 tons, can reach 12 ft forward and upward, and can carry 500 lb at boom capacity. Currently being tested at the Naval Air Development Center, Johnsville, Penna, the vehicle is expected to have industrial as well as military applications; i.e., atomic energy installations, chemical plants, and assembly and disassembly of machines generally. Estimated cost in lots of 50 will be $20,000 per vehicle. ■



Vacuum Alters Mechanical Characteristics of Materials

PALO ALTO—Research leading to space exploration is bringing scientists closer to an understanding of the fundamental properties of materials. In an interview here Dr M.R. Achter of the Naval Research Lab in Washington, revealed that materials undergo unexpected structural changes when tested in a vacuum in an attempt to duplicate conditions of outer space.

Some metals tested at NRL grow stronger, some weaker in a vacuum, Dr Achter said, and other characteristics as creep and fatigue are altered. Changes in temperature affect materials in a vacuum as well as in atmosphere, but at a different creep and fatigue rate.

Dr Achter advanced a theory to explain the behavior of materials in NRL tests. According to his hypothesis, two surface reactions between a material and air are possible. In one reaction, the surface of the material strengthens and hardens by oxidation. In the other, the surface cracks. A material is stronger in air or in a vacuum depending on which of these reactions dominates.

NRL work, Dr Achter continued, has further demonstrated that increased attention to surface finish of structural members is called for. Finishes may inhibit surface cracks, and lead to appreciable increases in ultimate strength.

Dr Achter predicted that a surface finish entirely impermeable to air would significantly heighten the strength of steel and make molybdenum one of our most valuable structural materials. Test data further indicated that ordinary glass under vacuum of 10^{-6} mm of mercury is more than three times as strong as glass exposed to air. ■

US Role as World Producer Fading

NEW YORK—"Our domestic economy has expanded; so have our international trade and investments in foreign countries. But our predominant world role has receded." So says a study by the National Industrial Conference Board.

Last year, roughly 19% of the non-Communist world's exports came from the US. This was only slightly above America's 1928 world export position. It represents a sharp drop from the 25% recorded in 1948 when America was producing for a goods-hungry world not yet able to produce for themselves.

In ownership of consumer durable goods, however, the US ranks above every other nation, according to the NICB study. A comparison of seven consumer durables—radios, cars, refrigerators, telephones, television sets, motorcycles and washing machines—reveals that America's per capita ownership lags only in motorcycles.

Several nations approach US levels in specific items; people in Sweden have almost as many telephones per capita, while Belgium and Denmark are virtually on a par with the US in television sets. There is no uniformity, however; Belgium, a leader in TV ownership, is well down the list in ownership of refrigerators. ■

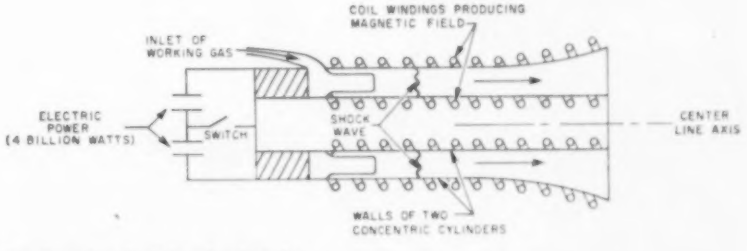
Avco Duplicates Interplanetary Shock Waves, May Assist Space Travel Weather Forecasts

EVERETT, MASS—An electric shock tube which duplicates interplanetary shock waves travelling in excess of 1 million mph from sun to earth was developed by Avco Manufacturing Corp.'s research laboratory here. Earlier experiments at the laboratory had obtained high temperatures in a pill-box apparatus which produced cylindrically converging shock waves in deuterium gas. However, the tube confirms Avco theory that interplanetary shock waves travel as the result of collisions of "force fields" surrounding hydrogen ions and electrons.

According to Dr Arthur Kantrowitz, laboratory director, the 30-in. tube, (below) triggered by an electrical charge of 4 billion watts, is able to reproduce for the first time thin shock waves which cause magnetic storms around the earth and disturb radio and telephone communications.

Significance of this experimental work lies in the clearer understanding of ionized gas, plasma, and how to confine and direct it by magnetic fields. About 1½-million F gas temperatures are obtained in Avco's electric shock tube. At this temperature, all known matter would vaporize instantly. In the apparatus, this ultra-hot gas is confined within a magnetic wall. The 1 million mph velocity is obtained by using a rarefied mass of hydrogen, pushed by a magnetic field tightly contained in the shock tube on every side but one.

The announcement kicked off Avco's program for dedication of its new $16-million research center at nearby Wilmington, Mass. ■



In Avco's electric shock tube . . .

a shock wave and gas velocities of greater than 1 million mph have been produced. Working fluid is hydrogen gas at very low pressure. Four billion watts of electric power discharged from a bank of condensers in about 2-millionths of a second provide the energy to hurl a cylindrical shock wave down the tube at 1-million-mph speed. Gas temperatures reach about 1½ million degrees. At these temperatures the gas is completely ionized. Magnetic fields confine the plasma, preventing it from touching the walls of the concentric cylinders.

NFPA Urges Standardized Rod, Bore Cylinder Sizes

ASHEVILLE, N. C.—Preferred cylinder sizes for rod and bore may soon be standardized if industry accepts a plan suggested by NFPA (National Fluid Power Association) at their recent spring meeting. The total number of sizes will be about ¼ of those now in common use, with no sacrifice in design choice. The plan recognizes that the most popular pneumatic and hydraulic cylinder sizes already tend to follow the American Standards Association system of "preferred numbers" (ASA publication Z17.1-1958). Over 300 cylinder manufacturers were surveyed before agreeing to the accompanying table, which is a good blend of common usage and ASA preferred numbers. Copies may be obtained from National Fluid Power Assn, 5595 N. Hollywood Av., Milwaukee, Wis.

Axial cylinder dimensioning also got attention; there was tentative agreement at the meeting to refer all axial cylinder dimensions to a given point on the rod. Although details of the method are yet to be settled, there is this that is significant: future cylinder catalogs of NFPA member companies may be easier to use if the method is approved, because all important axial dimensions will have the same reference no matter which catalog is picked, and all cyyinder manufacturers might follow suit.

Valve-rating techniques will get an overhauling soon, according to preliminary plans of the NFPA valve-rating committee, it was disclosed by John Pippenger, chairman. His article, "Better Ratings for Fluid Control Valves," scheduled for PE, June 22, gives his opinions concerning the need for more consistency and thoroughness in giving performance and life data in catalogs and drawings.

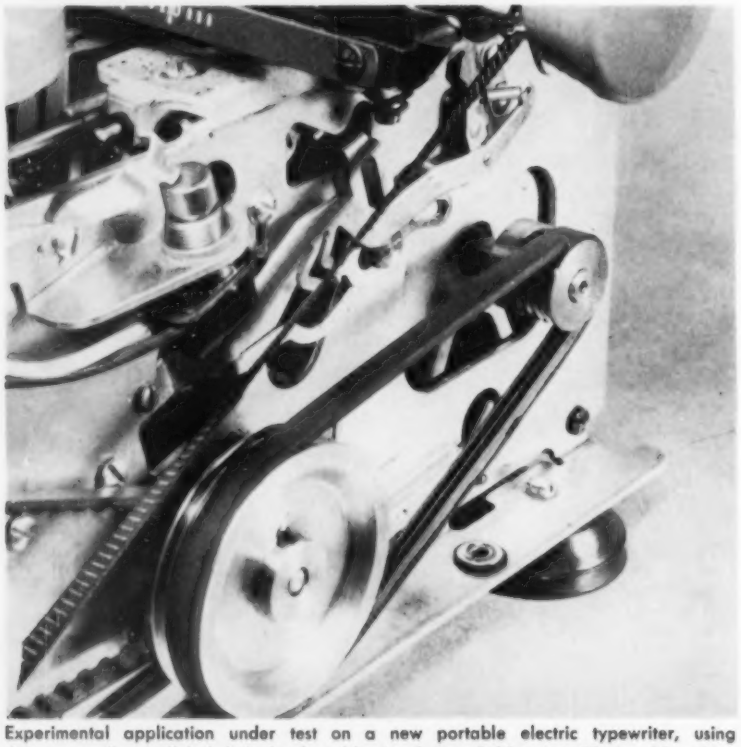
NFPA is gathering strength, indicated by progress made in some of their technical committees such as Valve Ratings and Cylinder Identification. Over 65 companies in the fluid-power industry are represented in the association, organized to improve business.

JIC standards will now include about 52 definitions that were suggested by NFPA at the recent Joint Industry Conference (*PE—April 27, p 26*). Aiding such standards-writing groups as JIC is an important function of NFPA **—Frank Yeaple**

ASA preferred no		NFPA cylinder dia's inches	
series 10	series 20	rod	bore
5/16	5/16	5/16	
	11/32		
3/8	3/8	3/8	
	7/16		
1/2	1/2	1/2	
	9/16		
5/8	5/8	5/8	
	11/16	11/16	
3/4	3/4	3/4	
	7/8	7/8	
1	1	1	1
	1 1/8	1 1/8	1 1/8
1 1/4	1 1/4	1 1/4	1 1/4
	1 3/8	1 3/8	
1 1/2	1 1/2	1 1/2	1 1/2
	1 3/4	1 3/4	
2	2	2	2
	2 1/4	2 1/4	
2 1/2	2 1/2	2 1/2	2 1/2
	2 3/4	2 3/4	
3	3	3	3; 3 1/4*
	3 1/2	3 1/2	3 1/2
4	4	4	4
	4 1/2	4 1/2	4 1/2
5	5	5	5
	5 1/2	5 1/2	
6	6	6	6
	7	7	7
8	8	8	8
	9	9	
10	10	10	10
	11		
12	12		12
	14		14
16	16		16
	18		
20	20		20

*3 1/4 is ASA 40 series, but is popular size.

Design New Belt for Small Drives



Experimental application under test on a new portable electric typewriter, using the new small, parallel-rib belt developed by Manhattan Rubber (see PE-May 25, p 19). Diameter of motor sheave is only ¾ in., giving a 2.5 speed reduction with smaller space. A timing belt can go into the same space but the major problem is noise. Absence of teeth and joints plus the positive tracking feature and the ability to absorb shock on overload, are additional advantages being weighed in this application, and the cost promises to be less, too.

We Change Initials

Albert Hauptli

Stanley J. Alling

"AH" are familiar initials to *Product Engineering* readers, particularly since we've been carrying a "Publisher's Postscript" every two weeks. "AH" is of course Albert Hauptli, publisher since 1945, and with McGraw-Hill almost 39 years. He retires as of today, but as you'll see in this week's "Postscript," he has no intention of settling down—he's merely shifting from the fly to the worm in his fishing, to use his own idiom.

The publisher of a magazine is its top boss, so from any point of view, much of what *Product Engineering* is today is assessable to Al Hauptli. His is a vigorous, open-minded approach to publishing and a willingness to try something new that has made it possible to maintain an outstanding position in technical journalism. During his stewardship, the magazine has had its greatest acceptance by readers and advertisers alike.

Just 50 years ago, Mr. Hauptli entered the publishing business—as a copy chaser on the *American Magazine* during summer vacations. He has been at it ever since.

SJA—for Stanley J. Alling—will be the new set of initials, but certainly not new to *Product Engineering*, which Mr. Alling joined eight years ago as advertising sales manager. For the past two years, he has been associate publisher. He has been with McGraw-Hill since 1939 on various publications, has a degree in metallurgy and practical experience in engineering. —EJT

NASA Names Committee to Deal with 'Long-range' Space Matters

WASHINGTON—A committee to deal with international, social, economic, and legal aspects of space research and exploration has been appointed by the National Aeronautics and Space Administration.

The committee's responsibilities center around that portion of the National Aeronautics & Space Act of 1958 (Sec. 102) which calls for "the establishment of long-range studies of the potential benefits to be gained from, the opportunities for, and the problems involved in the utilization of aeronautical and space activities for peaceful and scientific purposes."

Chairman of the committee is John A. Johnson, NASA's general counsel. Executive secretary is Jack C. Oppenheimer, former attorney adviser in the Dept of the Interior. ■

Price Cuts for Plastics

Booming capacity and increased competition is creating a temporary oversupply of basic plastic materials.

Phenol, for example, has been cut twice in the last six months, is now down to 16½¢/lb in carload lots.

New resins and elastomers are also dropping in price. Last month, DuPont reduced several urethan elastomers 35 to 45¢ a lb—bringing carload small-lot prices close to $1.50 and carloads close to $1.00/lb. ■

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control vibration over full frequency range

MB ISO-DAMP* mounts do what a conventional isolator cannot. They isolate at both low and high frequencies. Protecting the precision of airborne sighting mechanisms, they not only have the required softness, but also a damping mechanism that restricts resonant build-up to under 3.5 to 1 in any direction.

MB concentrates on standard mounts which are actually in the special performance class. If you have a problem, avail yourself of our 20 years of experience. Send for Bulletin 616A which tells more.

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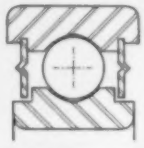
EXTRA-THIN BEARING WITH BUILT-IN SHIELDS

- SAVES SPACE
- SIMPLIFIES ASSEMBLY
- CUTS MAINTENANCE COST

PHOTO shows bearing ACTUAL SIZE

SECTIONAL DRAWING is 3 TIMES SIZE



SIZE: 10.500" OD; 0.270" wide; 0.250" thick.
BALL DIAMETER: 0.125" ±.000025".
MATERIALS: Stainless steel.
MAXIMUM RUNOUT OF OUTER RACE: 0.0002" TIR.
STATIC LOAD CAPACITY: Radial, 4,630 lb.; axial, 13,200 lb.
TORQUE: 5 to 6 inch-ounces at 100 lb. axial load.

Standard bearings often impose limitations on production economy and freedom of design. These restrictions are often eliminated by *special* bearings, custom-engineered by ITI. For example —

To save space, simplify assembly and prevent operating trouble, we designed and are producing this extra-thin-section ball bearing, equipped with a built-in shield on each side in place of separate shields. The shields fit so closely that they retain the lubricant and enable the bearing to pass the standard military sand and dust storm test. This construction assures long-lived low-torque operation, and cuts both assembly and maintenance costs.

YOUR design problem might likewise be simplified or your product improved by ball or roller bearings of special section or configuration, heat resistance, corrosion resistance, ultra precision, or other unusual properties. We design and produce such bearings to individual requirements, in any size from ¼" ID to over 70" OD; and we invite your inquiries.

FREE BULLETIN AFB-2 describes our work in this field—shows a wide variety of "specials"—tells about factors involved in special bearing applications. Write for it!

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WESTERN DIVISION PLANT: COMPTON, CALIFORNIA

Develop Unitized Typewriter, Teleprinter

ZURICH, SWITZERLAND—The built-in puncher of the new electric typewriter "Performat" developed by Triumph Werke AG, Nurnberg, Germany, in close cooperation with C. Lorenz AG, Stuttgart, Germany, simultaneously punches statistical material, news, vouchers, and other information, on a paper tape in international 5-letter word teleprinter code, while the original is typed. The punched paper tape stores the desired material which can be later transmitted over a teletype circuit.

PUNCHED TAPES

The punched tape can be further used for preparing punched cards with statistical material or account data.

The punched paper tape also can be used for controlling electronic computing machines, machine tools, and for rationalizing production methods. It stores the directions and converts them into electrical impulses at any desired time.

TYPEWRITER KEYBOARD

The flat keyboard has 46 keys with 92 characters, is the standard arrangement used in electric typewriters. All functions such as carriage return, line-spacing, back-spacing space bar, and continuous space bar, are arranged conveniently on the new electric typewriter keyboard.

AUTOMATIC CUT-OFF

If during writing a pause of longer than four minutes occurs, an automatic cut-off device switches off the whole machine and blocks the keyboard. This cut-off and blocking mechanism operates immediately when: the machine is switched off; the main fails or the plug is pulled; the cover plate of the machine is removed; or the built-in thermal cut-out comes into operation. ■

How Important is Engineering Training to Engineers?

LAFAYETTE, IND—Purdue University, largest US engineering college, questionnaired a quarter of its graduates from 1911 to 1956. A 70% return was received. The study is now in the printer's hands, should be released this fall. Extract below of the Purdue study compares opinions of all engineering graduates with those of graduates who transferred to other fiields. ■

	All	Tech Mgmt (23%)	Non-tech Mgmt (7%)	Non-engrg (6%)
A MUST requirement	58.3	68.5	19.3	10.0
Very important	26.3	25.6	43.6	30.1
Moderately important	10.6	5.4	30.7	28.7
Little importance	2.3	0	3.8	18.2
No importance	0.9	0	0.8	9.6

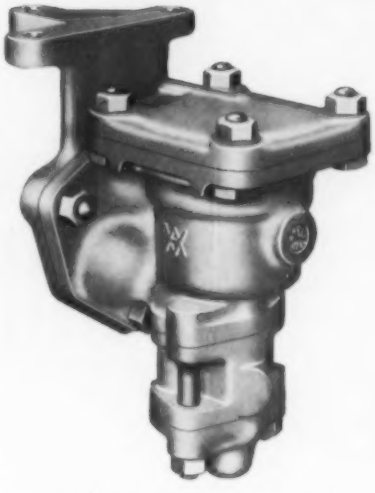
World Weather System Passes First Tests

ANN ARBOR, MICH.—The first flight tests of new meteorological instruments and techniques to be used in a global airborne weather-sensing system have been successfully completed, according to the Bendix Aviation Corp.

Tests of the new components for the system, which is designed to give forecasters a three-dimensional picture of the weather transmitted from aircraft, resulted in data that show the weather-gathering project "will enable man to extend his knowledge of weather not only over land-mass and sea areas now inaccessible for day-to-day forecasting, but also large air masses "in depth" at altitudes up to 150,000 feet," said Dr R.D. O'Neal, general manager of the Bendix Systems Division.

A Boeing 707, flying at just under the speed of sound, was used in the tests to eject at high velocities instruments called "radiosondes" that are able to sense atmospheric conditions and transmit the data back to the plane or to ground stations. The "sondes" were "planted" at intervals of several hundred miles, proving that the units could be ejected at high speeds and also transmit signals at great distances.

Typical Control Functions solved by AIR CIRCUITRY



● The H-5 RELAYAIR Valve, one of many Westinghouse Air Circuitry Components, is a pilot operated, directional control valve. It may be normally open or normally closed, depending upon port connections.

Various spring settings provide operating pressures from 3 to 150 psi. An easily removable pipe bracket permits removal of valve without disturbing pipe connections.

Envelope size: 7¼" x 7⅞" x 4⅜"
Maximum supply pressure 200 psi.

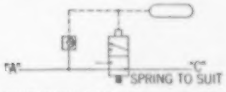
Typical Applications—In addition to the illustrated functions, this highly versatile valve has been and can be used in all conceivable types of air circuits. Some of these are as follows: cycling operations, safety interlocks, low pressure alarm signals, emergency cut-off of power, emergency brake applications, remote control station relays, sequence control timing, and many many others.

If you have a control problem, let us know about it. It can probably be solved with Air Circuitry. For more information, ask for Catalog A5-81.01.

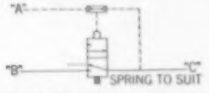
What is air circuitry?

This is the Westinghouse term for application of pneumatic control systems to industrial production operations. Safe, economical, precise Air Circuitry is now being used to solve the most rigorous and complex control problems in industry. Westinghouse Air Brake has pioneered the application and development of air control for more than 80 years. Today our engineers can design an air circuit which will help you boost production and cut costs in your plant or shop.

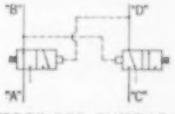
1. RELAY—To increase flow or pressure in an air circuit. An air signal directed to line "A" overcomes a spring opposed diaphragm to connect line "B" to line "C." Various spring values determine operating pressure.



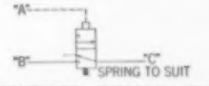
2. TIME DELAY—To provide automatic power unloading. Air signal pressure in line "A" flows through the device to line "C" to perform specified operation. A check valve with choke and a volume provides a time delay by requiring a predetermined pressure be built up before line "C" is vented to atmosphere.



3. LOCK-UP—To provide a hold-in feature. Air signal in line "A" connects line "B" to line "C." Air from line "C," through a shuttle valve, holds this connection when signal air is vented.



4. CRISSCROSS INTERLOCK — To prevent energizing one line before another is vented. With lines "A" and "B" energized with air pressure, line "D" is vented to atmosphere. Line "D" cannot be energized until line "B" is vented. The converse is true when lines "C" and "D" are energized.



5. SEQUENCE INTERLOCK—To insure one function is performed before another is initiated. Line "A" must be energized to a predetermined pressure before line "B" can pass air to the next function.

See the Yellow Pages under Cylinders for the Name of Your Local Distributor

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SCIENCE and POLITICS don't mix... or do they?

Once the exclusive preserve of professional politicians and business executives, the halls of government are now filled with some of the nation's top engineers and scientists. Here is a searching report on the clash of ideas between the technical community, Congress, and the Executive branch.

RICHARD M KOFF, *senior associate editor*

FORD R PARK, *associate editor*

Late last month the Senate's Committee on Government Operations heard testimony on whether or not the government should set up a Department of Science and Technology. The proposed department would be as big as Commerce and probably more influential than State—yet the total newspaper coverage in the *New York Times* was less than 10 column inches—and not on the front pages, either.

Why the neglect? Some will argue that the Capitol is not yet ready for a new department. This may be true—the wheels of government turn very slowly. But an important reason for the lack of urgency is that science already has the ear of government in no uncertain terms. Scientific committees and councils and agencies are multiplying like rabbits. The list on the next page includes most of the developments in just the last couple of years.

This is an impressive record, and while many of the innovations can be attributed to a far more science-conscious political and public atmosphere (Sputnik, et al) much of the credit must be given to Dr. James R. Killian and the President's Science Advisory Committee. The technical community has, for the first time in history, direct access to the executive branch through this committee. A feat of no mean proportions, the credit for building this bridge must go first to Dr. Killian.

The Special Assistant

Dr. Killian has been advocating the "politically and morally responsible" engineer for years. As president of MIT since 1949 he gained fame more for his genius at scientific administration than as a scientist in his own right. Today members of the Science Advisory Committee speak admiringly of his "ability to get to the heart of a problem," and to get the best scientific and engineering minds of the country to give of their time and attention (not one refusal yet from any man asked to serve). "Articulate" and "incisive" are the adjectives used to describe the man who, on the other hand, has yet to give his first exclusive press interview in his present role.

Similarly, this committee works behind closed doors. It argues that advice is its job—not publicity; that the few

booklets on nonmilitary topics, prepared and published over the committee membership list, represent about all that can be published, for security reasons.

There's no doubt that most of the problems presented to Dr. Killian and his committee are exclusively military in nature. There is also no question that advice, if it is to be of any use at all, should not be plastered all over the country's newspapers. But engineers and scientists have a right to know how conclusions are reached (the published reports tend to be weak in supporting data), particularly when they concern such sweeping and controversial problems as the Science Information Service or scientific education.

The Committee

Dr. Lloyd V. Berkner, president of Associated Universities Inc, and a member of the Science Advisory Committee at its start, lists eight committee responsibilities. The committee should:

1. Assess the impact of science on government in military, economic, and social aspects.
2. Evaluate the relative balance of the US program of science and research, to ensure adequate support for the whole range of opportunity for scientific research.
3. Be especially sensitive to new potentialities for scientific research and development, and to find means, and to recommend support for new areas of activity.
4. Review adequacy of support for reconstruction and extension of facilities for scientific research to keep America's research plant up to date.
5. Review constantly the character of opportunity and administration of scientists and engineers within government, looking to improvement of government personnel practices with respect to such men.
6. Ensure suitable and adequate federal practices in support of scientific information.
7. Monitor federal policies on international collaboration in science.
8. Review, from time to time, the effectiveness of broad federal policies with respect to the general health of scientific research.

Next to this list of specific tasks, some of Dr. Killian's own ideas seem rather general: ". . . to enhance the excellence of our science . . . and to add to our effort, relatively, in basic research; to extend the recognition of

What's Happened in WASHINGTON

SAC—President's Science Advisory Committee. "To provide a communications center for science in Federal Government . . . the committee also serves as a board of consultants to me [Killian] as Special Assistant to the President." The appointment of Dr. James R. Killian, Jr. as special assistant and the fact that the President heeds his advice has had much to do with the developments listed below.

NSF—National Science Foundation. Appropriation has been increased from $50 million in fiscal 1958 to $136 million in fiscal 1959. "The Foundation considers all requests for the support of basic research. . ." Requests are evaluated by a board of experts but once grant is made practically no strings are attached. More recently, and at the advice of SAC, a Science Information Service has been established in NSF to "provide, or arrange for the provision of, indexing, abstracting, translation, and other services leading to a more effective dissemination of scientific information. . ." This services is a coordinating one rather than a centralized operating center as advocated by some experts (see *PE—Jan 12, p 34*).

DD—Department of Defense reorganization included the creation of an office of the Director of Research and Engineering (Dr. Herbert York) plus the ARPA (Advanced Research Projects Agency) which provides research funds for defense and projects of common interest to military services.

NASA—National Aeronautics and Space Administration includes the former NACA with broadened scope for space research. Provides support for nonmilitary aeronautics and space research program of more broadly scientific interest than those supported by ARPA.

NASC—National Aeronautics and Space Council, with government as well as civilian scientific members to advise the President directly on space matters.

NDEA—National Defense Education Act offers federal support to the States for science education. Note also the 6-year $1-billion student loan bill.

Science Advisors—have been appointed to the Secretary of State, backed up by scientific attaches to major embassies. The Secretary General of NATO has a new science advisor and there is talk of a science committee in the United Nations.

Congress—has recognized the growing rate of science in government by creating NASA plus two outstanding committees: on Science and Astronautics (House), and on Astronautics and Space Sciences (Senate). The House committee is to review the needs of all government agencies concerned with science. Congress has restored appropriation to several halted programs (radio telescopes, atomic facilities) and made science service in government more attractive.

IGY—The International Congress of Scientific Unions, a nongovernmental organization, carried out the International Geophysical Year program with conspicuous success, both for its scientific value as well as a promotion of international cooperation.

FCST—Federal Council for Science and Technology is the most recent of developments in this area. It was established "to promote coordinated policy planning and more effective management of federal programs in science and technology." Chairman is Dr. Killian; membership includes heads of NSF, AEC, NASA, plus the Director of Defense, Research and Engineering (DD) and a policy official from Health, Education and Welfare, Interior, Commerce, Agriculture. Other departments and agencies are to be included when the subjects under discussion are of special concern to them. The purpose here is coordination on an operating level (something SAC has no authority to do). In a sense it is the president's answer to proponents of a Department of Science and Technology. No one is ready as yet to estimate the effectiveness of the answer. Best measures of FCST's contribution will be its continued existence under a new Administration.

science as a creative activity that augments man's dignity and understanding; to recognize that outstanding accomplishments in science appeal deeply to the hopes and aspirations of men everywhere and contribute to the prestige and good will of nations; to demonstrate that the democratic environment of the free world is the best environment for achievement in science . . ."

These lofty sentiments might be discounted as bombast from a man of fewer concrete accomplishments than Dr. Killian, but his associates are quick to point out that this is a "working" committee requiring effort and thought. They therefore find participation rewarding in terms of satisfaction of a job worth doing, as much as it is to the President in terms of useful counsel.

The committee is made up of 18 representatives "of those fields of science and technology currently important to government." These are civilians associated with universities, industrial laboratories and research institutes. They are augmented by six men from government having particular interest in the committee's deliberations.

All advice is ultimately the responsibility of this group; however, much of the detail study is done through a system of panels. Each panel is chaired by a committee member and other committee members may be tapped as well. Outside experts—specialists in the particular problem areas under study—are asked to serve as consultants forming a panel of from one to five or six members. So far only five panels have published their results: panels on space science, scientific information, strengthening American science, science and technology in foreign affairs, and science and engineering education, have made (or are in the process of making) recommendations approved by the committee and adopted by the President. At present some 60 panel members are working on about 15 problems.

Advice—not compromise

Often, at the start of a study, panel members are widely separated in their points of view. As with any subject important enough to warrant the attention of top minds, the discussions can get quite heated. But objective facts are great scientific convincers. By the time all the data have been collected, a panel has made considerable progress toward a unified conclusion. However, this committee also operates in controversial areas of science administration, education and information exchange—and here the published reports indicate considerable compromise.

Still, the recommendations are the best advice available considering the "state of the art" and the ingenuity or originality of the members. Each member is an individual in his own right. Most have made their mark in scientific circles with original contributions of very high order—several are Nobel laureates, for example. They meet to exchange ideas and stimulate new ones. This is the tried-and-proven method of scientific inquiry and it works in government as much as in the research laboratory or around the designer's conference table.

In a similar way there is considerable give and take between panels and committee. A panel progress report will be read by committee members and their comments aired at the next meeting. Have all fruitful lines of study been pursued? Is the phraseology clear and does it say what it is meant to say? The key standard: **Advice must be understandable as well as useful.**

Committee recruitment

With so many fields represented, an important characteristic of these committee members is the ability to talk the language of other disciplines. An additional attribute is necessary—experience in working with government. Most of the present committee members have been serving in government agencies off and on since World War II. Brilliant young minds are available to replace them, but most lack experience on the political scene. And so the panel system is something of a training ground in government. Engineers and scientists who have served on one or more panels make up a reserve of knowledgeable talent—ready to serve their turn as members.

Even though Killian's committee is now a smooth-running fact of life on the Washington scene, its lack of policy-making and jurisdictional power continues to worry many observers. Heavy ad hoc thinking on means for continental defense, detection of H-bomb blasts and the like is one thing. But how about the day-to-day scientific responsibilities of government now discharged in hundreds of nooks and crannies in 30-odd departments and agencies having technical activities? Hasn't science in government matured to the point where it deserves centralization and a cabinet-level voice? This line of argument is persuasive in its simplicity. But beneath the simplicity is a basic clash of ideas on the role of science in government.

A Department of Science and Technology?

As government spending on research, engineering and development mounts—accounting for one-half the US total spent for this purpose in 1958—Congressional interest in a Federal Department of Science and Technology is mounting too. Skeletal legislation for such a department was introduced in the Senate last year and again this year. But the wide difference of opinion on the idea promises a debate not seen since the Health, Education and Welfare Department was set up in 1954.

The arguments pro and con have been curiously muted so far, even though preliminary hearings on the bill (S. 676, Department of Science and Technology Act of 1959) have been held recently by the Subcommittee on Reorganization and International Organizations, headed by Sen. Hubert Humphrey. The reasons lie in the complexity of the

organizational problem, and in the differing philosophies that operate in the two areas–science and government. Then too, the Humphrey committee is moving very cautiously–offering the present bill only as a basis for discussion–since the impetus for a new department traditionally comes from the President.

What does S. 676 propose to do? How do these objectives clash with current concepts of the role of science and engineering in government? Is there a middle ground; how do we reach it?

What's in the Science Bill?

In addition to creating a new cabinet post called the Secretary of Science and Technology, S. 676 provides that several existing government agencies be transferred to the new department. These are: the National Science Foundation, the Atomic Energy Commission (to be redesignated as the Atomic Energy Administration), the National Acronautics and Space Administration, the National Bureau of Standards, and certain scientific functions now performed by the Smithsonian Institute. The agencies will continue to exercise their present functions subject to the supervision and direction of the new Secretary.

Beyond these specifics, the bill's sponsors have two broad objectifes, around which current debate centers:

(1) Improve the status of science and engineering, both in and out of government, in line with their increased importance to the nation and to peace.

(2) Seek ways to reorganize and coordinate government science activities so the nation will continue to progress and discharge its responsibilities to the free world in this area.

This clear concern over science's role in preserving national security and promoting international goodwill is understandable, and is shared by Dr. Killian, his Science Advisory Committee, and the technical community at large. Nor is there much quarreling over improving the status of the engineering and science. The arguments arise over method and philosophy: Will these aims be any more quickly achieved by organizing a huge federal department? Indeed, can you organize and coordinate science and technology at all?

It seems fair to say the response of engineers and scientists has been largely negative—all the way from obdurate refusal to even consider the idea, through a cautious "it depends" attitude, to a few cases where specific and well-considered schemes have been advanced.

Pure scientists, the most reluctant group, are certain that the search for truth, wherever it may lie, requires a detachment impossible to achieve in the bureaucratic atmosphere. As one SAC member puts it: "Basic research cannot be programmed so that there is no overlapping of effort. If it could be, it wouldn't be basic research. Qualified men must be left free to roam, intellectually, back and forth over each other's work as well as into the new areas. Only then will our storehouse of knowledge be replenished."

The Political View

At the opposite end of the spectrum sits the Senate Subcommittee, trying to construct "a suitable framework in which science and technology can be molded to the greatest common good." When scientists object that creation of a Science Department would place the science functions of the federal government under a political appointee, Senator Humphrey, recalling similar fears when the present Department of Health, Education and Welfare was set up, answers: "It is a matter of common knowledge that, in the world-renowned laboratories and clinics of the National Institute of Health of the Public Health Service, an arm of the Department of Health, Education and Welfare, the freedom of the research scientist to pursue his investigations, wherever they may lead, is a zealously guarded prerogative. Political control there is, of course, but only the political control founded in the fact that this is a government of laws and of political execution thereof, and under which this country has grown to its preeminent position in the world today."

Faced with the very real reluctance of scientists even to consider a Department of Science and Technology–as evidenced by refusal to discuss such proposals at scientific meetings, for example–the Subcommittee tried shock tactics. Appealing over their heads to the public-at-large, a Subcommittee staff analysis of the proposed legislation published in April 1958 stated bluntly:

"Although the free people of the world have never placed so much reliance on so few individuals, a majority of scientists have so far resolutely refused to recognize their responsibilities and recommend appropriate remedial legislative action. Instead, they have been content to retreat behind a screen of fear of our democratic processes."

A Scientist with a Program

These are strong words and they have had some effect, for there now seems to be more willingness to discuss what should be done. Dr. L. V. Berkner, head of Brookhaven National Labs, in arguing for a Department of Science and Technology, carefully divides federal responsibility for science into three parts: (1) research activities of existing departments that are vital to the missions of these departments, (2) supported research conducted by nongovernmental organizations and unrelated to any direct function of the supporting agency, and (3) departmental scientific and technical services not closely involved with executing the departmental mission, but of utmost importance to the federal government and the public interest.

Dr. Berkner contends that the third category of responsibility is poorly discharged by the government, mainly because the functions in the area are stepchildren–little understood by department heads, and thus understaffed

and poorly financed. These activities (oceanography, meteorology, etc.), says Dr. Berkner, need strengthening desperately and the best way to do this is to bring them under the control of a centralized department, leaving technical activities in the first two categories strictly alone.

Notable exceptions are the functions of two existing agencies, AEC and NASA. Berkner feels that though the work of these agencies belongs in his third category, their size and specialized functions justify independence.

How much centralization?

While Berkner's carefully circumscribed proposal has a certain logical appeal, the Humphrey Committee seems far from satisfied. With regard to NASA, for example, it says: "The Federal Space Program, in all its ramifications, provides further example of the need for coordination in the area of scientific endeavors."

Implicit here is the fundamental disagreement running through the whole debate: Are the technical activities of government readily identifiable so that they can be drawn into one central organization? Or does not science and technology pervade so many aspects of government affairs that its yeasty influence would be destroyed by any attempt to centralize it? In recent testimony before the Humphrey Committee a noted historian of science in government, Dr. Hunter A. Dupree, took the latter view:

"Complete centralization of administration would lead to the ruin of the adjustment between science and its uses which has been one of its glorious accomplishments."

The Science Council

This problem of adjustment must have been hotly debated in the SAC subpanel on "Strengthening American Science," whose report was published last December. The Federal Council for Science and Technology (see box p 29) was the subpanel's answer—in its words: "an effective instrument of government made up of representative government officers, that can promote closer cooperation among federal agencies in planning and managing their programs in science and technology and in achieving coordination."

There is evidence that the original concept was for Departmental representatives on the Council to be top scientists—many of them drawn from the dedicated career men now in government. As presently constituted, however, fewer than one-third the regular members are listed in the current edition of American Men of Science. This, and the fact that the Council has no policy-making or jurisdictional powers, has resulted in a "ho-hum, another committee" attitude among many interested persons, particularly the sponsors of S. 676. It has resulted in keen disappointment, too, among government career scientists who half-hoped their hour had come.

Senator Humphrey's committee seems convinced that the Council was created to head off Congressional action on a new department, by centering administrative power in the Office of the President. This brand of political control, comments Humphrey, "is apparently regarded as of a benevolent variety. From this attitude, which ignores the fact that the President enjoys complete authority over the policies and functions of both the executive departments and his own office, springs the outcry against creation of a Department of Science and Technology and the pleas for lodgment of high-level control within the immediate official family of the President."

However, Dr. Brode, Secretary Herter's science advisor, observed more hopefully before the Senate committee: "If this Council is staffed by policy-level persons who are recognized as competent science administrators or scientists with executive ability, and the Council assumes a role of leadership in establishing national science policy, it may lead to formation of an effective Department of Science."

Calling Mr. Hoover!

In this three-cornered argument, as in most involving government reorganization, the suggestion of a "Hoover Commission" to get the facts is, perhaps, inevitable. This approach was proposed formally last April before the Humphrey Committee by Dr. Augustus Kinzel, vice-president of the Engineers Joint Council and quickly endorsed by Alden Emery, executive secretary of ACS. The key question is the commission's composition and authority. The original Hoover Commission and its task forces were highly regarded because the members were carefully chosen, the project had the hearty and active endorsement of President Truman, and solid recommendations resulted.

Currently, the Humphrey Committee staff is preparing a resolution suggesting to the President that such a commission be established. Most probably the Hoover format will be followed: four members each from the Executive Branch, Senate, and House—plus two public members, presumably top scientists with broad knowledge of administrative problems. The resolution will call for a report at an early date—possibly as soon as the end of the year. The Senate committee is planning to resume hearings on science in government shortly, and the resolution will most certainly be high on the agenda. If both the Senate and the House approve the final version emerging from these hearings, the next move will be the President's.

Basic Library

White House reports by Science Advisory Committee

Introduction to Outer Space—March 26, 1958
Improving the Availability of Scientific and Technical Information in the United States—Dec. 7, 1958
Strengthening American Science—Dec. 27, 1958

Senate documents

Science and Technology Act of 1958, Report No. 90
Science Program—86th Congress, Report No. 120

Books

Science in the Federal Government—Dr. H A Dupree, Belknap Press, Harvard University, 1957.

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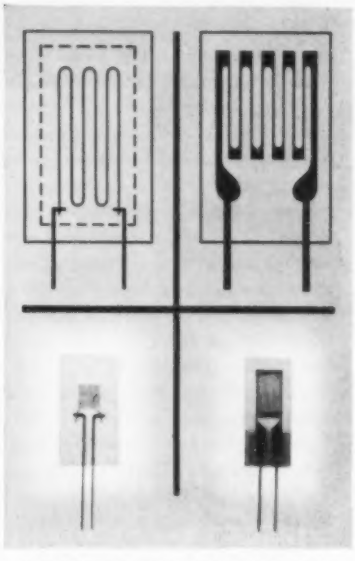

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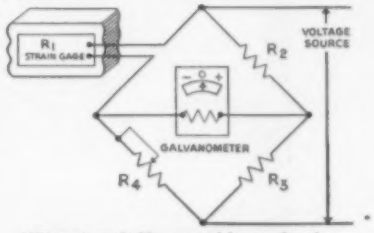

Wheatstone bridge provides a simple, highly accurate means of measuring strain gage resistance. Initial balance is achieved by adjusting variable resistor R_4.

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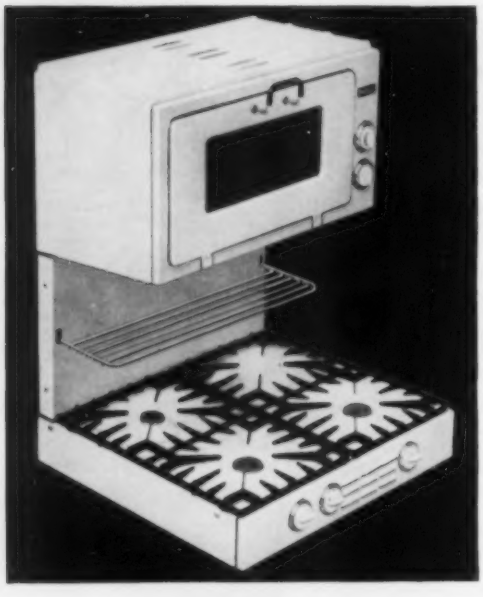
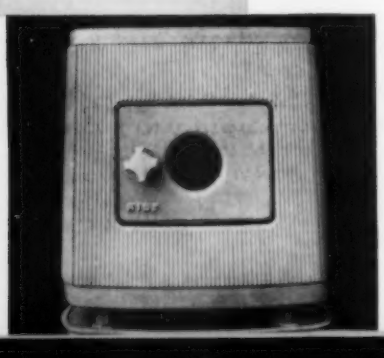
by ERIK HERLOW, *architect and professor of industrial design, Royal Academy of Art*

Gas range, below, which also comes with own cabinet base, was designed by Erik Herlow and Tormod Olesen for Ernst Voss. Heating and ventilating unit for shipboard, below right, by Sigvard Bernadotte and Acton Bjorn.



Adding machine, above, was given color scheme and crisper modern lines while retaining identifying shape. Duplicating machine, left, is intended for multilingual market, therefore uses instruction symbols throughout, rather than words. Both by Bernadotte and Bjorn. Oil-fired oven, at left, below, designed by Herlow and Olesen for Ribe Jernstoberi.



In coming years Danish manufacturing will have the task of supplying a growing population with sufficient employment opportunities and with increased earnings from foreign trade. Constantly growing exports since World War II of such products as furniture, ceramics and other housewares (see ceiling light at top of page, hand-made wooden chair at bottom) have demonstrated that Danish industry can compete. But to maintain and broaden this competitive power, to include manufactured articles such as appliances and capital goods, the same opportunities to cooperate with engineering and manufacturing personnel must be given industrial designers as were given Denmark's now world-famous furniture and ceramic designers by our old craft centers several years ago.

As we expand our manufacturing industries and apply efficient modern control systems to them, the industrial designer will become an ever more important connecting link between consumers and the engineering and management staffs. He will know consumer wants and needs as well as the structure of the enterprise. He will know the potentials of materials and processes and, at the same time, provide artistic, creative abilities and concepts.

Until now, comparatively few Danish manufacturers outside of furniture and applied art have accepted industrial design or recognized its potential contributions. This attitude is changing, however. To hasten this change, the Danish Industrial Designers Society has been founded. Its main task is to keep Danish industry informed about current design developments at home and abroad, and to serve as intermediary between manufacturers and designers.

A number of the Society's members operate consultant design offices, with each serving several manufacturers. An increasing number, however, are becoming full-time members of manufacturers' staffs.

The Danish government recently established a school connected with the Royal Academy of Art and directed by the writer, for the training of industrial designers. This is to increase the still inadequate number of these specialists. In addition, the Technical High School of Copenhagen recently instituted training in product development, with Professor Vagn Aage Jeppesen in charge.

design . . .

NORWAY

by H. E. JÖRNER, ME, *Head Dept. of Manufacturing Processes, Statens Industraining Center*

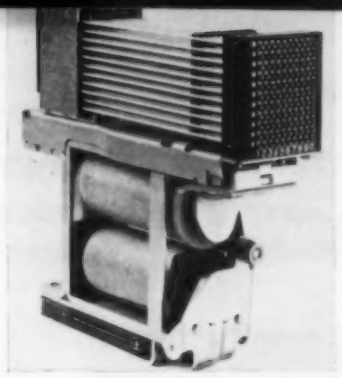
The esthetics of form and ornament has a long tradition in Norway. The boats and articles (at right and below) for everyday use preserved from the period of the Vikings are one example. But, as in most other countries, a long time was needed to apply such traditions to designing modern manufactured articles. This was partly due to a relatively small home market—little opportunity for large-quantity production.

First efforts to provide Norwegian products with appropriate shapes occurred in the mid-30s, when the A/S Elektrisk Bureau in Oslo developed a telephone handset of bakelite with the help of a Norwegian artist. The internationally known telephone company, L. M. Erikson, took it over as standard equipment, and it became one of the prototypes for similar equipment now in use all over the world.

Since World War II, management's interest in industrial design has been steadily growing. It has been extensively discussed in the technical and engineering press. The Norwegian Industrial Association's Bureau of Scientific Management has arranged a symposium which will include lecturers from Norway and abroad.

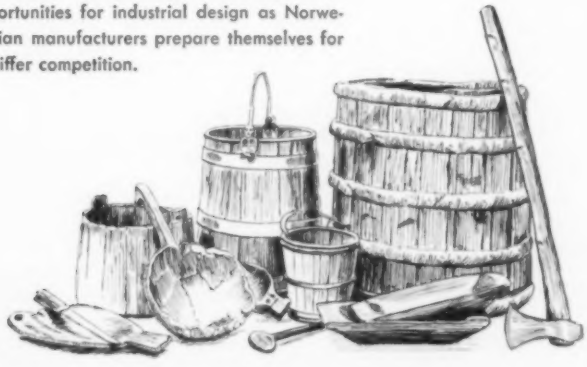
However, as yet there are no special educational facilities or programs for training industrial designers in the technical schools. The schools for handicrafts and applied art, which are closely connected with commercial trade organizations and interests, now have some courses adapted for training in industrial design.

There are now 18 members of the Norwegian Group of Industrial Design. It is associated with the international organization and has participated in a number of international exhibitions. This group looks forward to a consistent broadening of opportunities for industrial design as Norwegian manufacturers prepare themselves for stiffer competition.

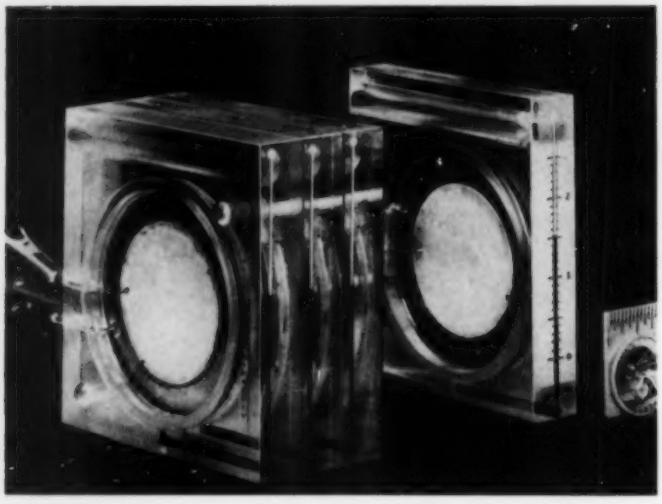


Space and functional requirements disciplined design of multiple-deck, 10-point selector relay, left, made by A/S Elektrisk Bureau. Electric range and steam iron, below, are typical Norwegian appliances.

Clearing saw, below, is for small trees and underbrush. Made by Jo-Bu A/S. Lawnmower is by Norsk Lettmetal A/S.



SIGNIFICANT COMPONENTS MATERIALS PROCESSES



Electrostrictive ceramic measures voltage . . .

in meter that consists of transparent plastic block enclosing two opposing metal disks to which smaller white ceramic disks have been bonded. Ceramic disks, coated on both sides with silver frit, form a capacitor. When electric potential is applied, ceramic contracts and changes volume of metal disk. Colored fluid in reservoir between the two plates is forced to rise in capillary tube, providing visual indication of voltage being measured. Surge chamber at top of block prevents building up back-pressure. Prototype models are less than ¾ in. wide. **Mullenbach Div, Electric Machinery Mfg Co, 2100 E 27th St, Vernon, Calif.**

Circle 11, Reader Service Card

Device for small-parts feeder . . .

continuously and automatically breaks up jams or inertia that result from interlocking of pieces, presence of dirt, dust, vapor film, or static electricity. Standard-amplitude feeding impulses are varied with automatically timed and adiustable energy inputs different from regular amplitude, jarring parts into further movement. These impulses are adjustable from 5 to 60 sec, at varying degrees of energy output, to suit parts. Feeding speeds from one per min., as well as normal speeds of 200 to 300 per min., are said to be possible Useful for any shape or type of part made from metal, glass, compressed powder, plastic and assembled parts in any size from 0.004 to 0.5 in. Can be used in conjunction with feeders operating between 0.6 and 1.2 amp. Special units are available for use with larger feeders. Operates on 115 v, or 60 cps, but can be adapted to any voltage. Standard unit lists $98 alone or $137.50 with built-in controller. From stock. **Affiliated Manufacturers Inc, Oldwick, NJ.**

Circle 12, Reader Service Card

Light-sensitive resistor . . .

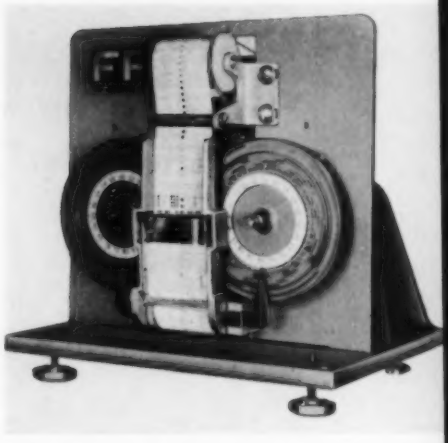
possesses resistance ratio in excess of 25,000:1, for a light-intensity, change from total darkness to 1400 ft-c. Consists of a cadmium sulfide cell with silver electrodes. Eliminates need for high-gain amplification stages. 59¢ each in production quantities. Delivery, 3 to 4 wk. Sample kits furnished on request. **Fetroxcube Corp of America, Saugerties, NY.**

Circle 13, Reader Service Card

Epoxy-back foil strain gages . . .

in three new types are said to offer high accuracy because proximity of gages to neutral axis of test reduces possibility of error. Rosette gages determine magnitude and directions of principal strains (0.5 x 0.5 in.); miniature gages are for use in areas of very steep strain gradient (0.163 x 0.034 in.); high fatigue life gages are for structures undergoing severe dynamic strains (0.250 x 0.505 in.). All are 0.001 in. thick. Most gages from stock. About $5 to $10 each. **Tatnall Measuring Systems Co, Sub of Budd Co, Box 245, Phoenixville, Penna.**

Circle 14, Reader Service Card



Analog-to-digital recorder . . .

based on shaft input, supplies analog values in binary-decimal punched tape form. Tape can be read directly, or translated automatically into standard punched cards or tape for computer processing. In addition, unit simultaneously supplies digital information in the form of electrical contacts that may be used for telemetering. Where available torque is insufficient, or signal is in electrical form, recorder can be used with servo system to record flow, pressure, temperature and other analog values. Can also be used with solenoid and ratchet wheel to count pulses during any given time period. May be operated from commercial power supplies or by battery. Single 6-v dry-cell battery is reported to power the unit on 15-min. readout intervals for an entire year. **Fischer & Porter Co, 116 Jacksonville Rd, Hatboro, Penna.**

Circle 15, Reader Service Card

Timing V-belt transmits power on both sides . . .

and can be used, for example, in a single serpentine drive to power all accessories from a common source. Integral construction combines timing belt, which requires no lubrication, with flexible V-belt. Manufactured in standard $\frac{3}{8}$ and $\frac{1}{2}$-in. pitches for light- and heavy-duty applications. Three other standard timing-belt pitches—$\frac{1}{4}$-in. for extra-light duty, $\frac{7}{8}$-in. for extra-heavy duty and $1\frac{1}{4}$-in. for double extra-heavy duty—are scheduled for production. Belts are capable of operating at speeds up to 16,000 fpm and on fixed centers without take-up adjustments. Speed ratios up to 30:1 are possible by their use. Pulley diameters as small as $\frac{1}{2}$ in. at 10,000 rpm are permissible, even with relatively heavy loads. Delivery on stock widths is 4 wk. Prices, at present, are slightly higher than company's regular timing belt line. **US Rubber Co, 1230 Ave of Americas, New York 20.**

Circle 18, Reader Service Card

Subminiature indicator thyratron . . .

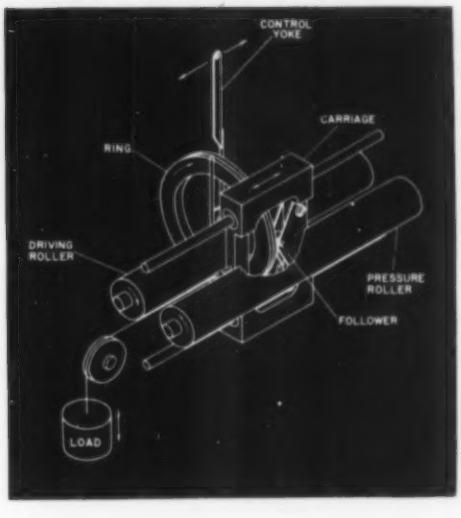
requires two coincident signals of 4.5 v and a negligible control current to produce neon indicating glow in dome. Glow may be viewed from any angle. Single signal applied to either of two control grids will not produce an indication. Size is 0.310 in. dia x 1.1 in. long, excluding leads. Filament voltage, 2.5 v ac; filament current, 300 milliamp. 1 to 25 units are $9.70 each; delivery is immediate. In quantities of 101 or more, units are $4.70 each. Delivery on production quantities can start within 2 wk. **Wiltec Electronics Inc, 53 Water St, S Norwalk, Conn.**

Circle 16, Reader Service Card

Air-actuated sampling switch . . .

is capable of more than 3600 closures per sec. Signals of 1, 2 and 3 milliv are said to be transmitted completely free from noise, without amplification or filtering of any kind. Closures are made and broken when air jet, directed at high speed toward individual pairs of contacts, forces them together. Contact closing time is less than 60 microsec; opening time is under 80 microsec. Up to 45 contact pairs can be housed in the switch enclosure. Two-pole switching can be supplied to any phase angle by adding a second row of contacts and incorporating two synchronized air jets inside shell. **Electric Regulator Corp, Norwalk, Conn.**

Circle 17, Reader Service Card



Mechanical-force amplifier

is actuated directly by flow-, pressure- or temperature-measuring elements or similar motion-producing mechanisms to position controls, recorders, encoders or other devices. Operating principle is comparable to variable-pitch lead screw. Driving power can be supplied by any external source, such as sub-fhp motor. Input force can be less than 0.04 oz; output of up to 18 oz can be produced. Linear output motion is said to be identical to input motion within 0.001 in. Useful travel is 2 in. and full-scale travel time is variable from 1 to 20 sec, depending upon driving speed. Prices start at $250. **Mechanical Components Dept, American Meter Co, PO Box 309, Garland, Tex.**

Circle 19, Reader Service Card

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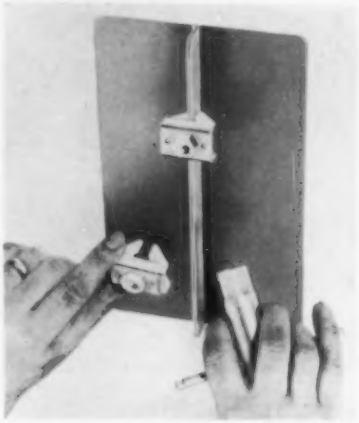


Clamp lock . . .
originally designed for assembly of flanged-panel constructions, is secured or opened by half-turn with $\frac{3}{8}$-in. hex wrench. Available with jaws to fit panels of any thickness. Fastening range of 0.025 in. permits clamping despite irregularities in material thicknesses. Closing pressure is said to be 400 lb; tensile strength, 700 lb. **Simmons Fastener Corp, N Broadway, Albany 1, NY.**

Circle 20, Reader Service Card

Polyurethane compound . . .
for general-purpose molding, encapsulation and coating is said to have excellent electrical properties and good fluid resistance. Two-part compound cures at room temperature and offers tensile strength of 2000 psi and 500% elongation. For temperatures from —65 to 300 F. **Coast Pro-Seal & Mfg Co 2235 Beverly Blvd, Los Angeles.**

Circle 21, Reader Service Card

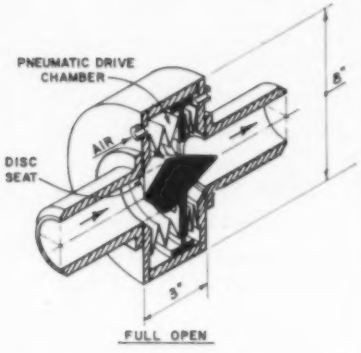
Linear-motion transducer . . .
is said to measure with accuracy of 0.0001 in. in ranges up to 0.120 in. Provides electrical output proportional to displacement of spring-loaded plunger. An inductance device, the unit has no sliding electrical contacts and is said to maintain calibration indefinitely. Priced at $88. **Daytronic Corp, 216 S Main St, Dayton 2, Ohio.**

Circle 22, Reader Service Card

Switch registers shock . . .
of predetermined amount from any direction within 90° of vertical axis, opening or closing an electrical circuit. 4130 chrome-moly steel pin with brass weight on one end actuates aluminum-bronze plunger against adjustment spring, which is

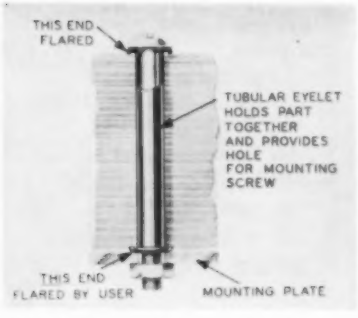
stretched across snap switch. Impact on pin from either end or side drives plunger down, actuating adjustable switch. DPDT switch is rated 125 v ac, 5 amp; 28 v dc, 3 amp inductive, 7 amp resistive (3½ amp for each switch). Weighs 20 oz. **George Harmon Co Inc, 18232 Parthenia St, Northridge, Calif.**

Circle 23, Reader Service Card



Valve has no moving parts . . . between fluid chamber and atmosphere. Suitable for shutoff or throttling of gases and liquids, valve is said to have negligible pressure drop across closure disk. Working-temperature range is −20 to 1500 F; working-pressure range is from 0.005 microns vacuum to 150 psig in smaller sizes, to 30 psig in sizes up to 72 in. Bellows forms fluid chamber and contains seat and disk. There is no opening to the atmosphere and no stuffing box or valve stem. Disk is opened and closed by pneumatic or mechanical gear drive. Offered in standard sizes of 2 to 12 in. **Singmaster & Breyer, 420 Lexington Ave, New York 17.**

Circle 24, Reader Service Card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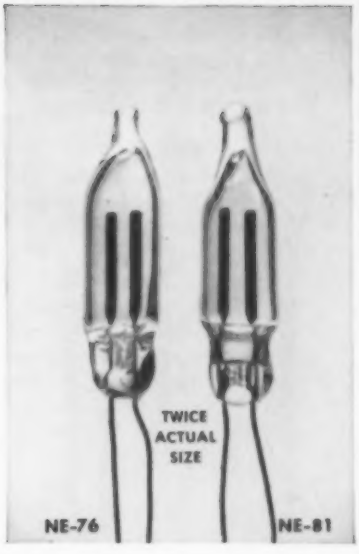
Tubular eyelets . . . in sizes up to ½ in. OD and any desired length are said to be lower in cost than drawn eyelets for lengths over 1 in. Used to clamp together components and provide method of mounting assembly by screw through eyelet. End of eyelet can be flared after assembly. Can be supplied in almost any metal with rolled, flared or beaded ends. **H & H Machine Co Inc, Noble & Jackson St, Norristown, Penna.**

Circle 25, Reader Service Card

Here are two G-E Glow Lamps that have critical starting voltages



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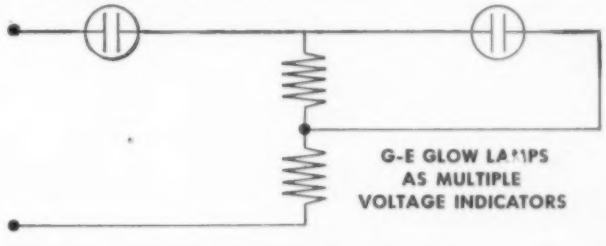
G-E NE-76—Pre-aged, stabilized glow lamp has closest starting voltage tolerances of any General Electric Glow Lamp (±4-volts d-c). Same tolerance is held on operating voltage. G-E NE-76 will perform well in: Switching circuits, logic matrices, gating circuits and similar applications. The leads are plated for easy soldering and the lamps are treated by the G-E Dri-film process for high leakage resistance in humid areas. A *red dot* near the anode lead indicates polarity.

G-E NE-81—Similar to the G-E NE-76—has slightly wider starting voltage tolerances (±8-volts d-c). Has plated leads to permit easy soldering and the G-E Dri-film process insures maximum leakage resistance under high humidity conditions. The same mild radioactive additive used in the NE-76 is used here to reduce dark effect. A *white dot* near the anode lead indicates this glow lamp's polarity.



DIRECT CURRENT CHARACTERISTICS

	NE-76	NE-81
Starting Volts	72 ± 4-volts d-c	72 ± 8-volts d-c
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Extinction Volts (in series with .25 megohm or more)	50-volts d-c	50-volts d-c
Design Current	0.4 m.a. d-c	0.3 m.a. d-c
Leakage Resistance (at high humidity)	100 megohms	100 megohms
NE-76 Life	To stay within above specifications for at least 1,000 hours when operated at 0.4 m.a.	
NE-81 Life	Change in Starting and Operating Voltage At .3 m.a.	± 5-volts in 6,000 hours

For further information write for free booklet entitled "Glow Lamps as Circuit Control Components", General Electric Co., Miniature Lamp Dept. M-901, Nela Park, Cleveland 12, Ohio.

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SIGNIFICANT COMPONENTS MATERIALS PROCESSES . . .

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Circle 26, Reader Service Card

Generation module . . . provides, on command from input signal, selection of up to 64 characters and symbols of any shape or size at writing speeds up to 50,000 per sec in present units. Centrally located system produces alpha-numeric characters or symbols that appear typically on cathode ray tube. Character-forming shaped beam tubes are not needed. Selection input and display equipment may both be remote from the generator. Suitable for continuous display of tabular information and/or insertion of written data into pictorial-type displays by means of time-sharing techniques. One generator can be used with any number of displays simultaneously. Selection of characters can be changed by inserting new character mask. Said to be adaptable to circuit reduction requiring very few sub-units for over-all system. 64-character module can be packaged in single standard equipment rack. **Government and Industrial Div, Philco Corp, 445 E Tioga St, Philadelphia.**

Circle 27, Reader Service Card

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NEW LITERATURE

What Every Supervisor Should Know

LESTER R BITTEL, Factory Management and Maintenance. McGraw-Hill Book Company Inc, 330 W 42nd St, New York 36. 9¼ x 6, 451 pp. $7.95.

The design field needs a good book by this title, written by an experienced engineering executive for engineers. I don't know of any, but until it's written, Mr Bittel's book will do While it is written for foremen—often rather specifically—where he treats fundamentals, the author writes a good handbook on supervising people—including engineers. The style is simple and direct, with a question stated in boldface and answered in a paragraph or two. Early chapters "About People at Work" and one on "The Art of Leadership" are good for engineers. A closing group of chapters on "Helping Yourself to Succeed" are also good, including one on "What a Supervisor's Wife Should Know About His Job." —RWC

Decision-making and Productivity

SEYMOUR MELMAN. John Wiley & Sons Inc, 440 Fourth Ave, New York 16. 5¾ x 8⅝, 260 pp. $7.

This is a study of the structure of today's large manufacturing organization and some of the principal forces that effect key operating decisions and policies. Management, the workers and their union are discussed at length, but the author's failure to understand the design and engineering force as a third influence often having important and separate effects is a major weakness. Probably the specific company examined in this book provides a good example of many of the important points that the author wishes to make, but observations based on several investigations are generally more useful to readers concerned with this subject.

Controlling Development and Design Costs

One of the papers delivered at the American Society of Tool Engineers' (10700 Puritan Ave, Detroit 38) "Planning for Profit Seminar," April 20-21, was entitled "Control of Research and Development Costs," by H. D. Long, Scully-Jones & Co (ASTE paper 199). Organization of this company's research and development system is described, and the experiences and results obtained are discussed.

"Cost Control Through Design," by R T Studer, Warner & Swasey Co (ASTE paper 204), discusses the responsibilities of the design engineer in this area and describes some of the techniques developed to aid him. "The Industrial Engineer's Responsibility for Design Cost Control," by L. J. Bayer, Warner & Swasey Co, describes some useful working relationships developed by design engineering and industrial engineering staffs (ASTE paper 205).

COLOR-CODING PLASTIC PARTS—Booklet, 6 pp. Explains process and advantages of dyeing plastic parts. Includes chart of various classes of plastics, sampling of applicable trade designations for each classification, and indication of whether parts can be dyed or tinted. Colorite Industrial Dyers, 244 W 38th St, New York 18.

Circle 1, Reader Service Card

METAL-FABRICATION FACILITIES—Brochure, 16 pp. Describes facilities for producing deep drawn parts and metal stampings to customer specification, emphasizing design engineering and metallurgy service. Press equipment and capacities are presented in chart form. Several case histories are cited. Peterson Products Corp, 4840 River Rd, Schiller Park, Ill.

Circle 2, Reader Service Card

CUSTOM-MOLDED PLASTIC PARTS—Report and check list, 4 pp. Includes 14-question check list for determining whether custom molded plastic parts and components will improve a product or lower costs. Monsanto Chemical Co, Dept CM, Springfield, Mass.

Circle 3, Reader Service Card

ETCHED-FOIL GAGES—Bulletin 4320, 6 pp. Specifications, characteristics and performance information on etched-foil strain gages. Includes dimensional drawings, designation system and prices. Baldwin-Lima-Hamilton Corp, Electronics & Instrumentation Div, 42 Fourth Ave, Waltham 54, Mass.

Circle 4, Reader Service Card

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No. 350

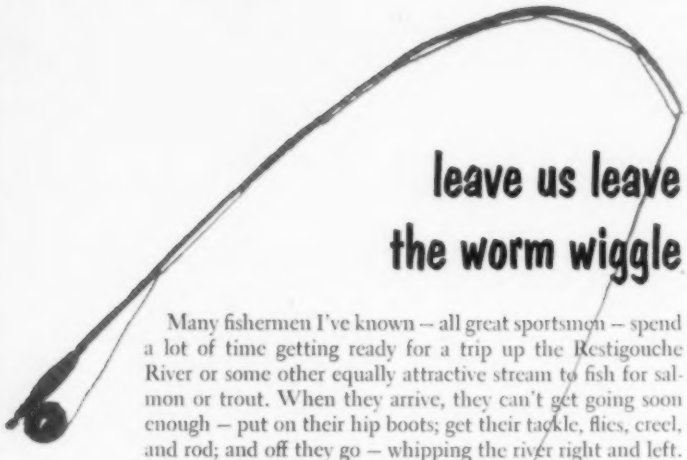
Here's the answer to your Check Valve problems on submersible pumps. The taper-type rubber poppet is noiseless, does not leak, opens easily. Works in any position.

All bronze body. Five sizes, ¾" through 2". May be tapped for one or two side connections as shown. Used as original equipment by many leading pump manufacturers.

Write today for Bulletin 203, or telephone Harrison 3313 for more information.

STRATAFLO PRODUCTS, INC.
FORT WAYNE, INDIANA

Publisher's Postscript...



leave us leave the worm wiggle

Many fishermen I've known – all great sportsmen – spend a lot of time getting ready for a trip up the Restigouche River or some other equally attractive stream to fish for salmon or trout. When they arrive, they can't get going soon enough – put on their hip boots; get their tackle, flies, creel, and rod; and off they go – whipping the river right and left. A tremendous lot of hard work – sometimes rewarding, but many times just experience.

That's the way this job of publisher of *Product Engineering* has been for me. We "fish" all sorts of engineering "streams." Some take an enormous amount of time, requiring long trips upstream wading against the current, and no matter how hard one works, there's never a strike. But every now and then the effort pays off handsomely. We really come home with a catch no one we know of has ever equalled. It's these catches that keep the editors going back time and time again.

That's the way it is in publishing. You've got to come up with a catch of unusual information, not readily found elsewhere, if you want your publication to attract top readership. You can't say anything about the terrific amount of energy expended on projects that turned out blank. That's why we need so many editors on *Product Engineering* – to fish all the engineering waters for the best catch of information, whether here or abroad, to keep you fully informed. We have a large group of topnotch editorial fishermen, from Tangerman on down.

They will keep on doing their jobs, but I'm going to pass out of the picture with this issue. We have compulsory retirement at McGraw-Hill at the age of 65 – so starting now, my long-time associate, Stan Alling, takes over as publisher of *Product Engineering*. He's well qualified, and I'm sure you'll see this publication rise to new heights of editorial and business impact, under his leadership.

I'm going to be sitting on the pier, maybe doing some consulting work or with just a worm on the hook. Anyway, I've had a lot of fun in my 39 years with our publications and especially the last 14 as publisher of *Product Engineering* and *American Machinist*.

I'm not going to stop working, although I'm not planning to wade up stream quite as vigorously as I used to. I'm sitting on the dock, my line is in the water; there's a fat worm on it, so leave us leave the worm wiggle. –AH

For Your Information (personal)

Pot shots with potatoes

Three hundred shots per potato . . . that's the rated efficiency of this all-metal, trigger-operated gun that makes its own bullets from a trusty Idaho (or, if you prefer, an apple or watermelon rind), and then fires them out a good 50 ft in the air. Just plunge the barrel into a fresh potato, says the manufacturer, E J Cossman & Co, Hollywood 28, Calif, twist it out, aim, and fire.

That's not all, says Cossman. Users will be rendering a public service. Each child should be able to run through about 12 lb of potatoes before he turns to other things. That could make a big hole in the current potato surplus. Price: 98¢ in retail stores.

Hot seat on the move

When next winter rolls around, at least one Englishman plans to keep warm in the right places. British Information Services reports William Pickles of Bradford, Yorkshire, has developed an electrically heated plastic foam padding for autos which, he says, is safe, easy to make, and draws very little current. He's already applied it to home furniture, using an electrical system similar to that in electric blankets, which operates at very low voltage, "gives 80 hr or more of heating for a penny's worth of electricity."

Pin-up heat pump

You can cut cooking and freezing time in half, says DuPont, with the aid of Freon-containing "Thermo Pins." Just stick in a pin or two, put the bird or roast in the freezer or the oven, and Freon's heat-transfer abilities help get the heat in or out as desired. Thermo Pin Corp, Box 406, Mineola, which makes the device, says it also reduces meat shrinkage and eliminates need for basting. Price: $14.95 for a package of pins.

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Why Don't They

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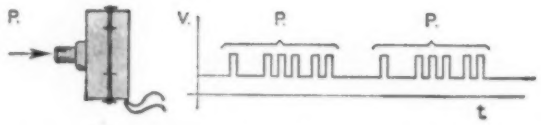
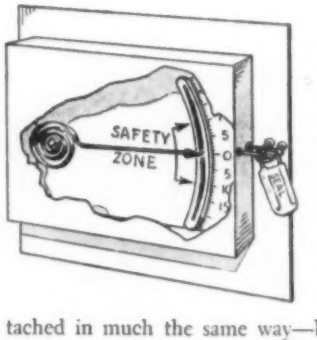


. . . a pressure transducer with digital output. Telemetry equipment usually transmits information in pulse code because analog signals can become lost or distorted in transmission. At the present time, analog readings in missiles are converted to digital pulse code by a rather complex electronic conversion circuit or by electromechanical shaft-position encoder (simply a sophisticated version of a rotary selector switch). Schemes involving measurement of collisions between molecules in a gas (for pressure) and counting particles of nuclear radiation have been considered and tried—but not with much success. —W SCOTT-MONCRIEF

. . . dry batteries with infinite shelf-life. There are automobile batteries on the market which are not activated until the electrolyte is added. Why not a dry battery with a seal or capsule separating active elements? Breaking the seal makes the cell ready for instant use. Would be particularly valuable for powering flashlights aboard liferafts, civilian-defense receivers and other equipment to be used only in the event of an emergency. And battery purchasers would always be assured of getting a fresh cell. Must be same size as present batteries and should cost only slightly more. —R MARIE



. . . a simple, lightweight, inexpensive device that indicates max shock or vibration which has been encountered. Would be useful in establishing blame when fragile items have been damaged in shipment. Also for measuring shock and vibration where attachment of accelerometer is impractical. It should have simplicity and reliability of a strain gage and might be attached in much the same way—but must be completely self-contained and tamper-proof. —G M MILES

Have you a problem, based on known scientific principles, which seems to have an answer somewhere within the limits of present technology? To inspire inventors along worthwhile paths, PRODUCT ENGINEERING invites you to trade such problems with fellow readers who may have a fresh viewpoint or more time for the necessary R & D. We will pay $10 for each one accepted.

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The Hand with the

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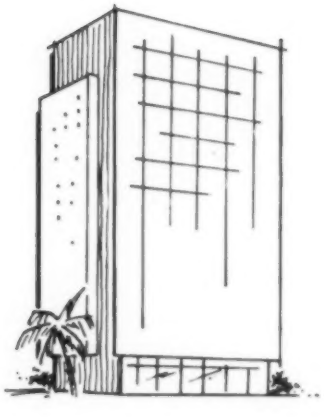

Who are the men with the "golden touch"? They are the architects turning out attractive renderings and perspectives; engineers drawing plans of extensive projects; designers creating bold new shapes and forms, and draftsmen making meticulous drawings and tracings.

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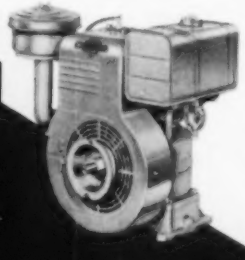

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